

ADS-B MASPS (DO-242A Draft) COMMENTS
RTCA SC-186

#	Author	Section	Page	Comment	Suggested Resolution
1	WG-6	3.2.3.1	75-77	IP46 – Include changes to text from 3.2.3.1 and Table 3-1.	See Attachment WG6-1 for needed changes to 3.2.3.1 and Table 3-1 which address IP46. WG6 Response: Agreed. Accepted. / Done.
2	WG-6	M.3		IP47 – Addition of proposed M.3 not included in draft.	See Attachment WG6-2 for new section to Appendix M. WG6 Response: Editorial / Agreed. Accepted. / Done.
3	WG-6	2.1.2.6	31	The resolution for IP54 was not included in the draft DO-242A. The paragraph in 2.1.2.6 which states the new requirement that the pilot shall have the ability to inhibit the broadcast of altitude if it is deemed invalid by ATC or the cockpit is missing.	See Attachment WG6-3 for section 2.1.2.6. (The needed paragraph to address IP54 is highlighted in yellow.) WG6 Response: Agreed. Accepted. / Done.
4	WG-6	3.3.3.1.2	89	<p>(Also see Jerry Anderson #20, Ron Jones #20, Tony Warren #9, UPS-AT #29, and Lincoln Laboratory #1-d.)</p> <p>In §3.3.3.1.2 the word “twice” needs to be deleted from the sentence regarding the potential 5% that do not meet the 95% acquisition range requirement.</p> <p>WG6 Response: While the occurrence of “twice” was a cut and paste error and needs correction, this sentence might be completely changed in response to Jerry Anderson comment #20 and Lincoln Laboratory comment #1-d</p>	<p>For the remaining 5% of the user population that has not been acquired at the 95% specified range, they will be acquired with high probability (at least 80%) within twice the MS reduced (99%) acquisition range specified in Table 3-4(a).</p> <p>WG6 Response: Editorial. Accepted. / Done.</p>
				<p>WG-6 consolidated Response to Jerry Anderson #20, Ron Jones #20, Tony Warren #9, UPS-AT #29, and Lincoln Laboratory #1-d:</p> <p><i>If this is to be a requirement in the body of this MASPS (an issue to be resolved by SC-186 plenary) then change the first paragraph of §3.3.3.1.2 to read as follows:</i></p> <p>“Mode Status (MS) acquisition range requirements are derived from the sample scenarios of Chapter 2, and are specified in <u>Table 3-4(a)</u>. For each of the equipage classes included in Table 3-4 (a), the mode status reports from at least 95% of the observable (radio line of sight) population shall (R3.14-A) be acquired at the range specified in the “Required 95th Percentile Acquisition Range” row of Table 3-4(a). Likewise, for each of the equipage classes included in Table 3-4 (a), the mode status reports from at least 99% of the observable (radio line of sight) population shall (R3.14-B) be acquired at the reduced range specified in the “Required 99th Percentile Acquisition Range” row of <u>Table 3-4(a)</u>.”</p> <p><i>Note: As requirements mature for applications that require MS reports, the required probability of acquisition at specified ranges may change. It is possible that these requirement may be more stringent in later versions of this MASPS.</i></p> <p style="text-align: right;">Accepted. / Done.</p>	

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5	WG-6	Table 2-3	57	In Table 2-3 the references to the notes are incorrect.	Within Table 2-3, increment all of the references to notes by 1
6	WG-6	3.3.2	81	<p>(Also see WG3 comment #2, Ron Jones comments 16 and 32, and UPS-AT comment 27 & 28.)</p> <p>The Note for Table 3-2(a) needs to be updated in the manner of Note 3 of Table 3-4(a) to reflect the acquisition range requirements in aft and side directions for A3 equipment.</p>	<p>Replace note for Table 3-2(a) with the following: <i>For A3 equipment, the 90 NM range requirement applies in the forward direction. The required range aft is 40 NM. The required range 90 degrees to port and starboard is 64 NM. (see Appendix H)</i> <i>For A3+ equipment, the 120 NM desired range applies in the forward direction. The desired range aft is 48 NM. The desired range 90 degrees to port and starboard is 85 NM.</i></p> <p>WG6 Response: (See response to UPS At comment #27) Accepted with modification. / Done.</p>
7	WG-6	Appendix H		Revise Appendix H to clarify the basis for the range requirements in <i>Note 3</i> to Table 3-4(a).	<p>[Ron Jones to provide draft text based on his comment #16.] (See Ron Jones' paper, "Proposed Insert for Appendix H.")</p>

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1	WG-5	2.1.2.5	31	<p style="text-align: center;">(Also see UPS-At comment #38.)</p> <p>No air-air surveillance application requires a navigation reference point other than that available from STC level GPS units. The only ground-air applications of interest are monitoring an aircraft at the runway threshold when on final approach, and monitoring runway exit clearance by the lead aircraft when on final. For small aircraft, the GPS antenna location (generally just behind the cockpit) is very close to the recommended aircraft mid-point and no correction need be considered. For large aircraft, the GPS antenna is typically about midway between the aircraft mid-point and the nose. For a 200 ft long aircraft, the difference in the GPS antenna location and this ADS-B reference point is then about one quarter the length, or 50 ft. (Note that the three sigma radius of GPS uncertainty alone is over 20 ft.) An uncertainty margin of about half the aircraft length would clearly be required if ATC surveillance incorporates fusion of ADS-B position with ASDE and multilateration estimates. For these reasons, any prudent low visibility runway clearance criterion would very likely allow for, on the order of, one aircraft length in indicated position uncertainty. The only surface-surface application of interest seems to be assurance that the landing aircraft has cleared the runway before the take-off roll begins. The above clearance requirements would also apply in this case. Finally if, for any reason, ground ATC needs position accuracy better than this, a data base associated with the filed flight plan can provide the exact correction factor.</p> <p>While no operational surveillance interest appears to support the need for the ADS-B reference point, we should also observe that modification of ADS-B data with this “azimuth orientation dependent correction factor” is platform/installation dependent computation with the attendant platform related STC issues.</p> <p>WG6 Response: WG6 proposes adoption of UPS-AT comment #38 which proposes a CC code for reporting position with respect to ADS-B reference point, and the elevation of the note within 2.1.2.5 stating if an aircraft is unable to report its position in such a manner, it not be allowed to report a NAC higher than the possible error in position due to ambiguity of its reference on the airframe.</p>	<p>Delete the requirement to modify the ADS-B data to account for the suggested reference point.</p> <p>Alternative proposal per March 21 SC186 Leadership Telecon: The requirement that ADS-B position data be broadcast relative to the ADS-B Navigation Reference Point is not meant to put the requirement onto the ADS-B avionics to perform these calculations. It is proposed that a note will be added to DO-242A stating that the ADS-B requirement is only to broadcast data that has been so corrected, and that other processors (e.g. personality modules and/or ASSAP functions) will perform these calculations.</p> <p>WG6 Response: Add the following note after modifying it to be consistent with resolution of UPS-AT comment #38: <i>“There are operational applications where the ADS-B position being reported needs to be related to the extremities of large aircraft; such as, runway incursion alerting and other future surface applications. Therefore, for the aircraft size codes and NAC_P codes defined, the position being broadcast must be translated to a common reference point on the aircraft. The translation calculation on position sensor source data may be performed outside of the ADS-B transmitting subsystem, therefore, specific requirements for this function are not defined by this MASPS.”</i></p> <p>Further, it is agreed that this should not be a requirement on all ADS-B link systems since it relies on other processing.</p> <p style="text-align: right;">Accept with Modification. / Done.</p>

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2	WG-5	3.3.3.1.4	90	<p>(WG3 comment #3 and Ron Jones comment #21 request the elimination of these update requirements and propose using the nominal rate under all conditions.)</p> <p>The text of Section 3.3.3.1.4 relating to T_U with 0.22 has a “shall” in it when it should not, and as such, it is in opposition with the “desired” requirements in Table 3-4(c).</p> <p>WG6 Response: The observation that the requirements specified in the text are inconsistent with the table is correct. The text should be modified to show the update rate for when there is a change in intent information past 40 NM is desired performance and not required.</p>	<p>When there is a change in the broadcast intent information as defined in §3.4.8.2 and §3.4.9.2, the update period for A2 and A3 equipage at ranges within 40 NM and for A3 equipage at ranges in the forward direction within 90 NM shall (R3.22) be T_U, such that</p> $T_U = \max\left(12\text{ s}, \quad 0.22 \frac{\text{s}}{\text{NM}} \cdot R\right)$ <p>where R is the range to the broadcasting aircraft and T_U is rounded to the nearest whole number of seconds.</p> <p>WG6 Response: Agreed.</p> <p style="text-align: right;">Accepted. / Done.</p>
3	WG-5	3.4.4.10.1	117	<p>(Also see Jerry Anderson comment #7 and UPS-At comment #41.)</p> <p>Section 3.4.4.10.1 requires the setting of a TCAS/ACAS Resolution Advisory Active Flag.</p> <p>There currently is no method to obtain this information since TCAS only provides it to the Mode-S Transponder for inclusion into the Resolution Advisory Report that is provided to the Ground Station via Ground Initiated Comm-B extraction.</p> <p><u>Rationale:</u> If this information is going to be required, then an appropriate means needs to be established for the transponder to provide this information to other users. It is not appropriate to connect to the TXCoord Bus (TCAS -to- Transponder) in order to obtain this information.</p> <p>If this information cannot be made available, then the requirement should be deleted.</p>	<p>Recommend that the ADS-B MASPs Working Group, along with WG-3 (1090 MOPS) and WG-5 (UAT MOPS) consider making requests to the ARINC AEEC (ARINC-718A) to have the transponder provide this information via a new label "274" to be transmitted at a minimum rate of once per second on the Transponder Maintenance Output bus (low speed ARINC-429 @ 12.5 kbps).</p> <p>See the proposed definition of the new "274" Label provided in <u>Attachment WG5-2</u>. (Current definition is found in <u>Attachment WG5-1</u>.)</p> <p>WG6 Response: WG6 believes this data is available from other TCAS buses and is available to non-transponder-based ADS-B systems.</p> <p style="text-align: right;">Rejected.</p>

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4	WG-5	2.1.2.11, Table 3.4.4, 3.4.4.10.3	34 112 117	(Also see C. Moody comment #5 and Ron Jones comments 7 & 27) The ATC Services Flag is to be set to ONE when “Receiving” ATC Services [in the current system, you change the transponder code when you are receiving services, and not before].	In paragraph 2.1.2.11, Table 3.4.4 and paragraph 3.4.4.10.1, each occurrence of “Requesting” should be changed to “Receiving.” Additionally, in paragraph 3.4.4.10.3, the 2 nd sentence should be changed to say that “... the transmitting ADS-B participant is receiving ATC services; ...” WG6 Response: Agreed. Accept Suggested Resolution as shown above. Accepted. / Done.
5	WG-5	3.4.8.10 through 3.4.8.14	126 and 127	Need to update the interpretation of target and selected altitude to be consistent with the current definition from ICAO. WG6 Response: The definitions used in the draft MASPS are largely based on an ICAO paper on selected altitude presented to SCRSP in April of 2001. WG6 believes the definitions are consistent with ICAO.	WG6 Response: Unless WG5 provides WG6 with specific ICAO definitions for target and selected altitude that are found to be inconsistent with those in the draft DO-242A, WG6 does not accept this comment. Rejected.
6	WG-5	3.3.1	78	(Also see Jerry Anderson comment #13 and UPS-AT #22.) Requirement R3.3 is inconsistent with Tables 3-3(b) and 3-4(a), and the discussion of Class B1 system participants in Sections 3.2.3.2 in that R3.3 discusses Class B1 installations with Class A2 transmit power. WG6 Response: The ERP requirements for class B1 aircraft in this revision are the same as in the original MASPS, however, they are inconsistent with the following tables that only require B1 aircraft to support ranges to 20 NM	Clarification of the MASPS for consistency is required. WG6 Response: Change sentence to read as follows: “Broadcast only aircraft (class B1) shall (R3.3) have ERP values equivalent to those of class A0 and A1, and A2 as determined by own aircraft maximum speed, operating altitude, and corresponding coverage requirements.” Accepted. / Done.

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7	WG-5	3.3.3.2.2	94	<p>(Also see comment UPS-AT #31.)</p> <p>The requirement R3.29 should be conditioned on either $NAC_p \geq 9$, OR $NIC \geq 9$. This is made necessary by aircraft that will have NIC, but will not provide NAC_p as inputs to the ADS-B avionics.</p> <p>WG6 Response: The potential weakening of the latency requirement R3.29 should be reviewed by Jonathan Hammer and WG-4. The latency requirements are a way of assuring that the Accuracy of ADS-B reporting is not compromised by excessive latency. If no accuracy metric is being reported, then there is little value in requiring a more tight latency value than 1.2 seconds, i.e. NIC should not be used as a substitute for NAC_p.</p>	<p>WG6 Response: Do not accept this comment.</p> <p style="text-align: right;">Rejected.</p> <p>Plenary Discussion: Accepted with modifications.</p> <p style="text-align: right;">Done.</p>
8	WG-5	Table 3-1	77	<p>ADS-B is already being used for the provision of ATS Cooperative Surveillance. This should be reflected in the MASPS.</p>	<p>Recommend that in the “Comments” column for the C1 row, the following text be added “Supports provision of ATS Surveillance for ADS-B System Participants where adequate Air-Ground range and integrity have been demonstrated.”</p> <p>WG6 Response: Agreed.</p> <p style="text-align: right;">Accepted. /Done.</p>

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1	Chris Moody	2.1.2.2.3	28	Editorial: “AD-B” should be ADS-B	WG6 Response: Agreed / Editorial. Accepted. / Done.
2	Chris Moody	2.1.2.13	36	Editorial: Note 2 under Table 2.1.2.13 change “than” to “then”	WG6 Response: Agreed / Editorial. Accepted. / Done.
3	Chris Moody	3.4.4	112	(Also see UPS-At comment #34.) Table 3.4.4 omits the ARV capability flag listed in Section 3.4.4.9.4	Either list ARV cap flag in the Table or delete Sect 3.4.4.9.4 WG6 Response: Agreed / Editorial. ARV Report Capability flag will be added to Table 3.4.4. Accepted. / Done.
4	Chris Moody	3.4.4.10.2	117	(Also see Jerry Anderson comment #32.) “18+/-1 second” is unnecessarily constraining in ADS-B context.	Instead say “approximately 20 seconds”. (Need a little latitude for some degree of link dependency on this time period.) WG6 Response: WG6 agrees that this requirement can be slackened, but wants to specify a specific range of duration. Therefore, WG6 proposes to change the last sentence of paragraph to read as follows: “Upon activation of the IDENT switch, this flag shall (R3.114-B) be set to ONE for a period of 20 ± 3 seconds; thereafter, it shall (R3.114-C) be reset to ZERO.” Accepted. / Done.
5	Chris Moody	3.4.4.10.3	117	(Also see WG5 comment #4 and Ron Jones comments 7 & 27.) Substitute “Receiving” for “Requesting”	This has been clarified by Anchorage Center Air Traffic as a result of UAT MOPS discussion. WG6 Response: Agreed. See resolution for WG5 comment #4. Accepted. / Done.
6	Chris Moody	3.4.7.5	122	There does not appear to be any guidance on when to use, or how to encode, “Mach”	List airspeed type 3 as “Reserved” WG6 Response: WG6 agrees that this value will not be used in DO-242A, but wants to specifically reserve the value for mach speeds. Therefore, WG6 proposes to list airspeed type 3 as “Reserved for Mach”. Accepted. / Done.

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1	R.H. Saffell, Rockwell Collins, Inc.	3.4.4.10.2	117	<p>Section 3.4.4.10.2 requires the setting of an IDENT Switch Active Flag.</p> <p>There currently is no method to obtain this information directly from the Transponder or from Transponder Control Mechanisms.</p> <p><u>Rationale:</u> If this information is going to be required, then an appropriate means needs to be established for the transponder or transponder control to provide this information to other users.</p> <p>If this information cannot be made available, then the requirement should be deleted.</p>	<p>Recommend that the ADS-B MASPs Working Group, along with WG-3 (1090 MOPS) and WG-5 (UAT MOPS) consider making request to the ARINC AEEC (ARINC-718A) to have the transponder to provide this information via a new label "274" to be transmitted at a minimum rate of once per second on the Transponder Maintenance Output bus (low speed ARINC-429 @ 12.5 kbps).</p> <p>See the proposed definition of the new "274" Label provided in <u>Attachment WG5-2</u>. (Current definition is found in <u>Attachment WG5-1</u>.)</p> <p>WG6 Response: WG6 agrees that SC186 - as a committee - should make such a request to AEEC.</p> <p style="text-align: right;">Accepted.</p>
2	R.H. Saffell, Rockwell Collins, Inc.	3.4.8.8	126	<p>Section 3.4.8.8 requires the ability to determine the states of "acquiring", "capturing", or "maintaining" the Horizontal Mode.</p> <p>Existing FMS and/or FCU systems do not provided this information in a consistent manner from one vendor to the next or in one installation to the next.</p> <p><u>Rationale:</u> If this information is going to be required, then an appropriate uniform means needs to be established to provide this information to the ADS-B transmission device.</p>	<p>The requirement to determine "acquiring", "capturing", or "maintaining" horizontal, vertical, heading, altitude, and / or altitude rate information may have originated in the interpretation of the earlier definitions of BDS 4,0 in the ICAO Manual of Mode-S Specific Services (see <u>Attachment RS-1</u>). In researching the availability of appropriate data to make such decisions, it became apparent that such information was not readily available in reasonably common methods throughout the industry. Consequently, BDS 4,0 has been redefined as shown in <u>Attachment RS-2</u>. Note that the new definition of BDS 4,0 provides for Hold Mode information, but not for "acquiring", "capturing", or "maintaining".</p> <p>Therefore, it is recommended that the ADS-B MASPS requirements be adjusted to be more consistent with the Manual of Mode-S Specific Services and require only declaration of the "Hold" mode when it can be so determined.</p> <p>WG6 Response: This field will become a 2-bit field with a ZERO value being an "unknown" or "unavailable" condition.</p> <p style="text-align: right;">Accepted with modifications. / Done.</p>

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3	R.H. Saffell, Rockwell Collins, Inc.	3.4.8.14	127	<p>Section 3.4.8.14 requires the ability to determine the states of "acquiring", "capturing", or "maintaining" the Vertical Mode.</p> <p>Existing FMS and/or FCU systems do not provide this information in a consistent manner from one vendor to the next or in one installation to the next.</p> <p><u>Rationale:</u> If this information is going to be required, then an appropriate uniform means needs to be established to provide this information to the ADS-B transmission device.</p>	<p>Same as for Comment 2.</p> <p>WG6 Response: This field will become a 2-bit field with a ZERO value being an “unknown” or “unavailable” condition..</p> <p>Accepted with modifications. / Done.</p>

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1	WG-3	2.1.2.19.2 3.4.9	41, 128	<p>(Also see Ron Jones Comments 9 & 30, UPS-AT comments #16, Robert Manning's comment #3, and Lincoln Laboratory #1-h.)</p> <p>The requirements for TC Reports are included in two sections of DO-242A. The report information contents are defined in section 2.1.2.19.2 (Long Term Intent) and the performance requirements associated with TC Reports are defined in 3.4.9. Introductory text should be added to both of these sections to indicate that the requirements associated with TC Reports may change as the requirements mature for the applications that will use TC Reports.</p> <p>WG6 Response: WG6 agrees that a caveat is needed in §2.1.2.19.2 similar to the one at the top of §3.4.9. However, WG6 feels that it is not appropriate to put such caveats in body text and recommends to plenary that the text remain in a note.</p>	<p>1. Add the following paragraph as the 2nd paragraph under 2.1.2.19.2.</p> <p>“The postulated requirements described below for long-term intent reporting may be revised in future editions of these ADS-B MASPS as the requirements for the associated ADS-B applications mature. Implementations should not include specific provisions for long-term intent reporting until the associated application standards are mature.”</p> <p>2. Delete Note 1 under 3.4.9 and add the following paragraph as the 1st “non-Note” paragraph of that section.</p> <p>“The postulated requirements for Trajectory Change (TC) Reports are to be the subject of further validation within the context of the associated applications. Implementations should not include specific provisions for TC+0 Reports until the application standards are mature. The requirements for TC+0 Reports may be revised in future versions of this ADS-B MASPS.</p> <p>WG6 Response:</p> <p style="text-align: right;">Referred to plenary.</p>

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2	WG-3	Table 3-4(a) and Appendix H	87	<p>(Also see Ron Jones comments 16 and 32, and UPS-AT comment #27)</p> <p>The ballot draft DO-242A has modified the air-to-air range requirement for the flight path deconfliction application in Note 3 to Table 3-4(a). The revised Note 3 for Table 3-4(a) incorrectly interprets the range requirement from Appendix H. Rather the 64 NM range requirement applies to targets at +/- 45 degree from forward and not from port or starboard (i.e., +/- 90 degrees from forward) bearing angles. Furthermore, there is no basis presented in Appendix H to justify the increase in aft range to the 48 NM value in the new Note 3 to table 3-4(a).</p> <p>WG6 Response: There is agreement that this is a difference in the perspective from which this requirement is being viewed, (encounter angle vs. bearing) and not a disagreement over the requirement itself.</p>	<p>Correct Draft DO-242A to the range values as specified in DO-242 as there is no justification for the proposed changes nor are the proposed changes of Table 3-4(a), Note 3 consistent with the analysis of Appendix H (neither the original Appendix H or DO-242 nor the proposed revised Appendix H of DO-242A).</p> <p>Please see <u>Attachment WG3-1</u> for further explanation.</p> <p>WG6 Response: Suggested resolution to UPS-AT comment #27 to clarify this requirement was accepted.</p> <p style="text-align: right;">Accepted with Modification. /Done.</p>

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3	WG-3	3.3.3.1.4	91	<p>(Also see Ron Jones comment #21.)</p> <p>The 12 second update rate for TS and TC reports when there is a change in intent information is a doubling of the TCP update requirements from DO-242, yet there is no analysis or justification given for this stringent requirement. It is not practical for safety applications to ever use intent information, so the nominal update rates specified for TS and TC reports should be sufficient at all times.</p> <p>WG6 Response: The justification for this requirement has been discussed numerous times with members from WG3, 5, and 6. It is suggested that this comment can not be resolved among the comment authors and WG6 and that all further discussion on this comment be at plenary. (WG5 correctly noticed in their comment #2 that the A3 requirement is only to extend to 40 NM. Ranges up to 120 NM are to be desired.)</p>	<p>Either delete middle two rows of Table 3-4(c) and all associated text, or mark all entries in those rows as desired and change the text to read as follows:</p> <p>When there is a change in the broadcast intent information as defined in §3.4.8.2 and §3.4.9.2, the update period for A2 and A3 equipage at ranges within 40 NM and for A3 equipage at ranges in the forward direction within 90 NM shall (R3.22) is desired to be T_U, such that</p> $T_U = \max\left(12\text{ s}, \quad 0.22 \frac{\text{s}}{\text{NM}} \cdot R\right)$ <p>where R is the range to the broadcasting aircraft and T_U is rounded to the nearest whole number of seconds. It is desired that this higher update rate shall (R3.23) be maintained for at least two update periods before returning to the nominal update rate. If implemented, these requirements are applicable to TS Report update rates for A1 equipment for ranges of 20 NM or less.</p> <p><i>Note: It is desired that requirements R3.21 and R3.22 the higher update rates defined above for when there is a change in the broadcast intent information should be met by A2 equipment at ranges up to and including 50 NM and by A3 equipment up to and including 120 NM.</i></p> <p>WG6 Response:</p> <p style="text-align: right;">Referred to plenary.</p>

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4	WG-3	3.3.3.1.1 3.3.3.1.3 3.3.3.1.4	82, 89, 90	<p>(Also see Ron Jones comments 13, 22 and 23, and Lincoln Laboratory comment #1-i.)</p> <p>In each of the referenced subparagraphs, there is a sentence that that should be deleted from the paragraph text, which starts <i>“For the remaining 5% of the user population that has not been acquired ...”</i></p> <p>This is the 2nd sentence of the 2nd paragraph of 3.3.3.1.1</p> <p>This is the last sentence of the 1st paragraph of 3.3.3.1.3</p> <p>This is the last sentence of the 1st paragraph of 3.3.3.1.4</p>	<p>Delete the sentence of each respective paragraph, which starts “For the remaining 5% of the user population” and add a “Note” immediately following each respective paragraph, which states: <i>“For the remainder of the user population that has not been acquired at the specified acquisition range, it is expected that those ADS-B participants will be acquired at the minimum ranges needed for safety applications.”</i></p> <p>WG6 Response: See recommended resolutions for Ron Jones’ comments 13, 22, and 23.</p> <p style="text-align: right;">Accepted with modification. / Done.</p>
5	WG-3	3.1 App. B	66	The definition of ADS-B Message should be clarified.	<p>Change “modulated packet” to “block”</p> <p>WG6 Response: Agreed.</p> <p style="text-align: right;">Accepted. / Done.</p>

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1	Jerry Anderson	2.1.1.1	25	Does R2.1 need to be standardized across different links?	? WG6 Response: It might be preferable to delete this requirement instead of defining standardization all ADS-B links must follow. Withdrawn by author.
2	Jerry Anderson	2.1.1.2	26	Same question as above. (Does R2.2 need to be standardized across different links?)	? WG6 Response: It might be preferable to delete this requirement instead of defining standardization all ADS-B links must follow. Also, standardization of ADS-B reports across all links was proposed in Issue paper 34. this Issue paper was deferred do to the complexity of the problem and the impact this will have on the links. Withdrawn by author.
3	Jerry Anderson	2.1.2.3	30	This is required, but there is no SHALL. WG6 Response: The SHALL for this requirement is found in §3.4.4.6. While 3.4.4.6 is referenced , a stronger link to the requirement should be included.	Insert a SHALL. WG6 Response: Change last sentence in 2.1.2.3 to read as follows: “However they <i>are</i> required (§3.4.4.6) to be transmitted by aircraft above a certain size, at least while those aircraft are in the airport surface movement area. Accepted with modification. / Done.
4	Jerry Anderson	2.1.2.5 & 3.3.3.1.1	87	If the Position Reference Point is not required when the length code is 0, does the Max. error in the last row of the last column of Table 3-4(a) not apply to length code 0?	Change Note 6 in Table 3-4(a) to indicate that this error specification is not required for length code 0. WG6 Response: Change note 6 to read as follows: <i>The position accuracy requirement for aircraft on the airport surface is stated with respect to the aircraft’s ADS-B position reference point (§2.1.2.5) if the conditions specified in §2.1.2.5 are met.</i> Accepted. / Done.
5	Jerry Anderson	2.1.2.9	33	No SHALL. WG6 Response: The requirement that heading is to be broadcast when an ADS-B participant is on the airport surface is specified in Table 3.4.3 and §3.4.3.12. Also, §3.4.4.16 specifies the requirement that the heading type (True/Mag) be included in the MS report. Heading is also required when available within the ARV report as specified in 3.4.7.6.	Insert SHALL. WG6 Response: All requirements for when heading must be broadcast are specified in Section 3. No change needed in 2.1.2.9. Withdrawn.

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6	Jerry Anderson	2.1.2.10	33	No SHALL. WG6 Response: The requirement that Capability Class (CC) Codes are to be broadcast and contained within the MS report is specified in Table 3.4.4 and §3.4.4.9. Further, subparagraphs of 3.4.4.9 specify the definitions of each CC Code.	Insert SHALL. WG6 Response: All requirements for when CC Codes are to be broadcast and definitions for those codes are specified in Section 3. No change needed in 2.1.2.10. Withdrawn.
7	Jerry Anderson	2.1.2.10 (3.4.4.9.1, 3.4.4.9.2) & 2.1.2.11 (3.4.4.10. 1)	33 & 34	(Also see WG5 comment #3 and UPS-At comment #41.) Note: Before you can operate an ADS-B transmitting subsystem on an aircraft with a CDTI or an ACAS, you will have to show that your installation can transmit this required information and the ACAS information required in 2.1.2.11. The design assurance level for this information is not yet known, as applications have not yet been validated to use this information.	None. Just be careful what you ask for. You might get it. WG6 Response: No action required.
8	Jerry Anderson	2.1.2.11	33, 34	No SHALL. WG6 Response: The requirement that Operational Mode (OM) Codes are to be broadcast and contained within the MS report is specified in Table 3.4.4 and §3.4.4.10. Further, subparagraphs of 3.4.4.10 specify the definitions of each OM Code.	Insert SHALL. WG6 Response: All requirements for when CC Codes are to be broadcast and definitions for those codes are specified in Section 3. No change needed in 2.1.2.10. Withdrawn.
9*	Jerry Anderson	2.2.1	46	Last paragraph, second sentence begins “Requirements”. WG6 Response: Table 2-3 is really used to define a set of assumptions for operational domains on which many requirements in Section 3 are based.	Change to “Expected requirements” per Table 2-3. WG6 Response: Instead of using “Expected requirements”, the sentence will read as follows: “ Assumptions for A/V-to-A/V scenarios are summarized in <u>Table 2-3.</u> ” Also, the title for Table 2-3 will be changed to the following: “Summary of Expected A/V-to-A/V Performance Requirements Assumptions for Support of Indicated Applications.” [Jerry concurs.] Accepted with modification. / Done.

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#	Author	Section	Page	Comment	Suggested Resolution
10	Jerry Anderson	Table 2-3	57 & 58	Combine Notes 2, 3 & 6 or reference Notes 2, 3 & 6 under Alert Time in first column. WG6 Response: Since Notes 3 and 6 are referenced elsewhere in the Table, combining them not recommended. Note 3 says “best engineering judgment” and Note 6 references Appendix J. Note 2, which is the only note currently referenced under “Alert Time” is a combination of notes 3 & 6 as it includes both “best engineering judgment” and an App J reference.	Combine Notes 2, 3 & 6 or reference Notes 2, 3 & 6 under Alert Time in first column. WG6 Response: Incorporate some language from notes 3 and 6 into note 2 so that it reads as follows: “References are provided where applicable. Alert time data is provided in Appendix J for simulated scenarios. Else, best engineering judgment was used to obtain performance data.” Accepted with modifications. / Done.
11	Jerry Anderson	Table 2-4	59	What does Note 5 (Altitude Accuracy) have to do with Altitude Rate in Table 2-4b?	? WG6 Response: This note is referenced in Table 2-4(b) when it should be referenced 2-4(a). Make appropriate correction. Accepted. / Done.
12	Jerry Anderson	Table 2-4	59	Note 3 refers to Table 3-2. Should that be Table 2-3?	Change to Table 2-3. WG6 Response: Agreed. Correct Note 3 to reference Table 2-3. Accepted. / Done.
13	Jerry Anderson	3.2.3.2	76	(Also see WG5 comment #6 and UPS-AT #22.) Says B1 is permitted to have A0 or A1 transmit power. Section 3.3.1, third paragraph, third sentence says B1 shall have power of A0, A1, or A2. WG6 Response: <u>Also reference WG5 comment #6.</u>	Delete A2 from Section 3.3.1. For clarity, create a Class B0 that is equivalent to A0 and let B1 be the same as A1. WG6 Response: Agreed. This will require new item in bulleted list within 3.2.3.2 and adding “B0” to the Class column of the B1 row for table 3-1. Also, a global search of DO242A will be needed on “B1”. Accepted. / ??
14	Jerry Anderson	3.3.1	79	Third paragraph, fourth sentence says ground vehicles shall provide a 5NM range to “A1” receivers. Table 3-4(a), last column says B2 will provide 5NM to all Class A receivers.	Change “an A1 class receiver” in referenced sentence to “class A receivers”. WG6 Response: Agreed. Sentence will be changed to read as follows: Ground vehicles operating on the airport surface (class B2) shall (R3.4) provide a 5 NM coverage range for class A receivers. Accepted. / Done.

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15*	Jerry Anderson	3.3.3.1.1	82	<p>(Also see comments 22 and 23, WG3 comment #4, and Ron Jones comments 13, 22, and 23.)</p> <p>Second paragraph, second sentence says, “they will be acquired with high probability”. There is no “SHALL”. Table 3-4(a) does not include this “requirement”.</p> <p>WG6 Response: This comment will no longer be relevant if the suggested resolution to comments 13, 22, and 23 from Ron Jones are accepted.</p>	<p>Delete referenced sentence.</p> <p>WG6 Response: Move sentence into a note as proposed in Ron Jones comment #13.</p> <p style="text-align: right;">Accepted with Modification. / Done.</p>
16*	Jerry Anderson	Table 3-4(a)	87	<p>(Also see WG3 comment #2, Ron Jones comments 16 & 32, and UPS-AT comment #27.)</p> <p>Note 3 was changed and is now unclear.</p> <p>WG6 Response: Comment #2 from WG3 questions the accuracy of Note 3. These two comments need to be considered together.</p>	<p>Return note to its original form or state that these new ranges apply at angles of +/-45 degrees for right and left quadrants and +/-135 degrees in the rear quadrant.</p> <p>WG6 Response: See suggested resolution for UPS-AT comment #27</p> <p style="text-align: right;">Accepted with Modification. / Done.</p>
17	Jerry Anderson	Table 3-4(a)	87	<p>In Note 6, should the word accuracy be replaced with error?</p> <p>WG6 Response: Yes it should.</p>	<p>?</p> <p>WG6 Response: In Note 6 for Table 3-4(a), “accuracy” will be replaced by “error”.</p> <p style="text-align: right;">Accepted. / Done.</p>
18*	Jerry Anderson	Table 3-4(a)	87	<p>(Also see Ron Jones Comment #17.)</p> <p>Note 10 say, “Lower rates for MS are under consideration.” No update rate is being considered for MS.</p>	<p>Delete this sentence. Change next sentence to read “MS reports should be made....”.</p> <p>WG6 Response: Note 10 is deleted entirely. (See the resolution of Ron Jones’ comment #17.)</p> <p style="text-align: right;">Accepted with modifications. / Done.</p>
19*	Jerry Anderson	Table 3-4(a)	88	<p>Note 11 references Section 2.2.2.4. Should that be 2.2.2.6? The title of 2.2.2.6 is “Aircraft Needs for Flight Path Deconfliction Planning (Cooperative Separation in Oceanic/Low Density En Route Airspace).” The last sentence is confusing. This is for low density airspace.</p>	<p>Fix the reference and delete the last sentence.</p> <p>WG6 Response: See Lincoln Laboratory comment #1-f.</p> <p style="text-align: right;">Accepted with Modification. / Done.</p>

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20	Jerry Anderson	3.3.3.1.2	89*	<p>(Also see WG6 #4, Ron Jones #20, Tony Warren #9, UPS-AT #29, and Lincoln Laboratory #1-d.)</p> <p>In the first paragraph, last sentence there is no SHALL. Table 3-4(a) says this is required.</p> <p>WG6 Response. Either a SHALL should be added to the sentence, or the row in Table 3-4(a) should be relabeled as either “Desired” or “Expected” instead of “Required” 99th percentile.</p>	<p>If this new requirement has been validated, add a “SHALL” to the referenced sentence.</p> <p>WG6 Response: Refer to consolidated response to WG6 comment #4. (WG6 agrees to change “should” to “shall”. However, Jerry would like proof of requirement’s validation. Also see disposition of LL#1-d. The effect of this new requirement may be equivalent to change the 95% MS requirement to 50 NM for class A2.) Referred to plenary.</p>
21	Jerry Anderson	3.3.3.1.2	89	<p>In the last paragraph, last sentence the word “acceptable” is wrong. Validated applications will determine what is acceptable.</p>	<p>Delete “acceptable.”</p> <p>WG6 Response: Agreed: “acceptable” will be deleted. Accepted. / Done.</p>
22*	Jerry Anderson	3.3.3.1.3	89	<p>(Also see comments 15 and 23, WG3 comment #4, and Ron Jones comments 13, 22, and 23.)</p> <p>First paragraph, last sentence contains no “SHALL.”</p> <p>WG6 Response: This comment will no longer be relevant if the suggested resolution to either comment #4 from WG3 or comments 13, 22, and 23 from Ron Jones are accepted..</p>	<p>If this requirement has been validated, add a “SHALL” to the referenced sentence.</p> <p>WG6 Response: See Ron Jones comment #22. Accepted. / Done.</p>
23*	Jerry Anderson	3.3.3.1.4	90	<p>(Also see comments 15 and 22, WG3 comment #4, and Ron Jones comments 13, 22, and 23.)</p> <p>First paragraph, last sentence contains no “SHALL.”</p> <p>WG6 Response: This comment will no longer be relevant if the suggested resolution to either comment #4 from WG3 or comments 13, 22, and 23 from Ron Jones are accepted.</p>	<p>If this requirement has been validated, add a “SHALL” to the referenced sentence.</p> <p>WG6 Response: See Ron Jones comment #23. Accepted. / Done.</p>

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24*	Jerry Anderson	Table 3-4(c)	92	(Also see Lincoln laboratory comment #1-g.) What is the purpose of the last two rows? If the intent changes it will be update in accordance with the previous two rows. If it does not change, why update it? Is this a message broadcast requirement or a report output requirement?	Delete last two rows. Referred to plenary.
25*	Jerry Anderson	3.4.3.2.b	106	An estimate of NIC is now required. An estimate of NUC was not required in 242. How do you estimate NIC? WG6 Response: In a segmented message system, the value of NIC should be that which was last received, as it can not be estimated. However, this is a time-critical element in that “no data available” should be indicated if an update is not received in the preceding coast interval.	Delete requirement to estimate NIC. WG6 Response: Clarification s needed that NIC is a time-critical element, but that it is not to be estimated. NIC will remain as item b.vi , and a note will be added that reads as follows: “Estimation of NIC is to done by simply retaining the last reported value.” Accept with modification. / Done.
26*	Jerry Anderson	3.4.3.2.c	106	Must the report assembly function track the range to determine the coast interval to use? Is there a “no data available” bit in the SV report?	Delete requirement. WG6 Response: Clarification will be added that that in this context, “time-critical” only applies to <u>received</u> report elements and that marking the data as “no data available” will be done by clearing the associated validity bit(s). (For NIC this will be done by setting NIC to ZERO.) (Accept with modification.)
27*	Jerry Anderson	3.4.3.2.d	106	What are the non-time-critical elements of the SV report? Are there any?	Delete requirement. WG6 Response: Accepted. / Done.
28*	Jerry Anderson	3.4.3.19	110	Acquisition now requires MS elements.	Add MS to SV in first sentence. WG6 Response: Agreed. First sentence in 3.4.3.19 will be changed to read as follows: The “Report Mode” provides a positive indication when SV and MS acquisition is complete and all applicable data sets.” Accepted. / Done.

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29*	Jerry Anderson	3.4.4	111	<p>Third sentence of the first paragraph says, “These elements require lower update rates than the SV report.” MS reports don’t have any update requirements.</p> <p>WG6 Response: This sentence discusses MS report elements, not the report itself. However, clarification of this subtlety could be accomplished.</p>	<p>Delete sentence.</p> <p>WG6 Response: Agreed.</p> <p style="text-align: right;">Accepted. / Done.</p>
30*	Jerry Anderson	Table 3.4.4	112	<p>(Also see comments 35 – 39, Ron Jones Comment #28,</p> <p>WG6 Response: WG6 asks plenary if they can be empowered to do these edits without full plenary review. WG6 feels the material for Status Change report needs to be clarified. WG6 would recommend that language be added that it is preferred that ADS-B systems support the rapid conveyance of changes in the values of time-critical elements within the MS and TC reports directly with broadcast messages. However, for some ADS-B systems which do not fully buffer these reports, a report such as the SC report defined in DO-242A could be a means used to convey the changes in these report elements.</p>	<p style="text-align: right;">Accepted. / Done.</p>

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31	Jerry Anderson	3.4.4.1	113	This requirement was 10 sec in 242. Why was it changed to 24 sec?	Change to original requirement. Delete Note. WG6 Response: Withdrawn.
32	Jerry Anderson	3.4.4.10.2	117	(Also see Chris Moody comment #4.) Why 18+/-1 sec? Since there is no update or refresh requirement, there is no guarantee that 18 seconds will do it. WG6 Response: 18 ± 1 sec was chosen because that is the current Transponder IDENT requirement. However, per comment #4 from Chris Moody WG6 recommends changing this requirement to be 20 ± 3 sec to loosen the requirement and make it more compatible with the UAT 4 second epoch.	Delete 18 sec requirement. WG6 Response: See WG6 resolution for Chris Moody comment#4. Accepted with modification. / Done.
33*	Jerry Anderson	3.4.8	123	I thought this was not going to be required. WG6 Response: Per plenary agreement in December the Target State (TS) report IS to be required for A2 and A3 equipment. (It is also to be an optional requirement for A1 equipment.)	Please make clear that this is not required in this version of the MASPS. WG6 Response: WG6 recommends that this comment is not accepted. Rejected.
34	Jerry Anderson	3.4.9	128	(Also see comments WG#1, and Ron Jones comments 9 and 30.) I thought this was not going to be implemented with this version of the MASPS. WG6 Response: Per plenary agreement in December the Trajectory Change (TC) report IS to be developed as requirements for consideration in this version of the MASPS. However, it was later proposed by the SC186 leadership that the plenary direct WGs 3 & 5 NOT to implement the TC reports in the MOPS document currently being developed.	Please make clear that this is not ready for implementation in a MOPS. WG6 Response: Note 1 at the top of 3.4.9 indicates that the requirement for TC reports are “to be subject to further validation”, and that “early implementations should be aware that the requirements for TC+0 reports may be refined in future versions of the MASPS.” However WG6 does not feel notes specific to plenary decisions or MOPS “blessed non-compliance” are appropriate. If the caveats about the lack of validation of these requirements need to be strengthened, refer to comment #1 from WG3. Refer to plenary.

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35	Jerry Anderson	Table 3.4.9	129	(Also see comments 30, 35 – 39 and Ron Jones Comment #28) Need to remove SC report.	Change Note 2 to read, “While this version of the MASPS specifies these elements as requiring rapid refresh, the specific refresh requirements for these elements are to be defined in a future version of this MASPS. Messages to support rapid refresh of the required elements will be broadcast when one or more of the elements changes from its last broadcast value.” WG6 Response: : See WG6 response for comment #30 Accepted. / Done.
36	Jerry Anderson	3.4.9.1	129, 130	(Also see comments 30, 35 – 39 and Ron Jones Comment #28) Need to remove SC report.	Delete SC. WG6 Response: : See WG6 response for comment #30 Accepted. / Done.
37	Jerry Anderson	3.4.9.5	132	(Also see comments 30, 35 – 39 and Ron Jones Comment #28) Need to remove SC report.	Delete Note 2. WG6 Response: : See WG6 response for comment #30 Accepted. / Done.
38	Jerry Anderson	3.4.9.6	132	(Also see comments 30, 35 – 39 and Ron Jones Comment #28) Need to remove SC report.	Delete Note. WG6 Response: : See WG6 response for comment #30 Accepted. / Done.
39	Jerry Anderson	3.4.9.23.1 & 2	142, 143	(Also see comments 30, 35 – 39 and Ron Jones Comment #28) Need to remove SC report.	Delete SC. WG6 Response: : See WG6 response for comment #30 Accepted. / Done.

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1*	Ron Jones	2.1.2.2.2	27	Non-concur comment: The revised notes in this section have lost the central idea of the original note 2, specifically where the transponder code in question is a Mode S 24-bit address.	Add the following text as a new first sentence to the text of the proposed Note 2: “Correlation of ADS-B messages with Mode S transponder codes will facilitate the integration of radar and ADS-B information on the same aircraft during transition.” WG6 Response: Add Ron’s sentence above as Note 3 in §2.1.2.2.2. [Ron concurs with this resolution.] : Accept with modification. / Done.
2*	Ron Jones	2.1.2.2.2.1	27	Non-concur comment: Text needs to clarify that a unique address is required. WG6 Response: Must the address be unique if it is a not an ICAO address??	Modify text to read: “...or some kind of other <u>unique</u> address....” WG6 Response: “another kind of address that is unique within the operational domain.” (Ron concurs.) Accepted with modification. / Done.
3*	Ron Jones	2.1.2.2.2.2	27	Non-concur comment: WG6 Response: Must the address be unique if it is a not an ICAO address??	Modify text to read: “...or another kind of <u>unique</u> address....” WG6 Response: “another kind of address that is unique within the operational domain.” (Ron concurs.) Accepted with modification. / Done.
4*	Ron Jones	2.1.2.2.2.2	28	(Also see comment # 29.) Non-concur comment: Note 1 - No justification for suggesting 4 bits are appropriate for the address qualifier. Since a given ADS-B link may only need to report that either the address is an ICAO address or that it is a specific type of alternative address. While allowing 4 bits in the report format could be acceptable the final statement in Note 1 implies that ADS-B links should also provide 4 bits in ADS-B messages. This is not justified. WG6 Response: This material is only guidance and is contained in a note. If a particular link decides it only needs 1 bit, it certainly can do so as that is the minimum requirement.	Delete the final sentence in Note 1. WG6 Response: Change the number of bits allocated in each report format for the Address Qualifier report element to 1, and modify the last sentence of the Note, deleting any reference to “4 bits.” This applies to each report format, starting with the SV report format in §3.4.3. [Ron Jones accepts this resolution of this comment.] Accept with modifications. /Done.

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5	Ron Jones	2.1.2.5	31	Issues with this requirement were raised by WG5 comments and an alternative resolution for adding a note was proposed by 3/21/02 SC-186 Leadership Telecon.	Add note as proposed at 3/21/02 Leadership Telecon stating that the ADS-B requirement is only to broadcast data that has been so corrected, and that other processors will perform these calculation. WG6 Response: See WG5 comment # 1. Accepted. / Done
6	Ron Jones	2.1.2.7	32	It is not clear from the text what the role of ARV is vs. geometric velocity, although this is later explained in para. 3.4.7. Since this is the first time ARV is introduced some additional text is needed to put ARV into the proper context. WG6 Response: Agreed that conditions for broadcast should be referenced in §2.1.2.7. However, this should be done by referencing the requirements, not restating them.	Add the following text as a new final para. under 2.1.2.7: “Air-referenced velocity is only be used in the event that valid ground-referenced geometric velocity is not available to the ADS-B system.” WG6 Response: Add the following text as a new final para. under 2.1.2.7: “Conditions for when the broadcast of ARV data is required are specified in §3.4.7.1. Accepted. / Done.
7	Ron Jones	2.1.2.11	34	(Also see comment #27, WG5 comment #4, and Chris Moody comment #5) “Requesting ATC services” should be “receiving ATC services” since this code is not intended to be used a means for a flight crew to request ATC services but rather is an indication that the aircraft is receiving services from ATC. WG6 Response: Agreed.	Correct text to read “receiving ATC services” WG6 Response: Agreed. See resolution of WG5 Comment #4. Accepted. / Done.
8	Ron Jones	2.1.2.18	38	It not clear why the definitions of the emergency/priority status values were deleted here. Since Chapter 2 is a statement of the operational requirements, it would seem appropriate to retain the list of values from DO-242A, para. 2.1.2.3.1	Retain list of values from DO-242A, para. 2.1.2.3.1. WG6 Response: Agreed. Either encoding should be defined in 2.1.2.18, or a reference to the encoding definition in §3.4.4.8 needs to be more explicit. Accepted. /Done.

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9*	Ron Jones	2.1.2.19.2	41	<p>(Also see comment #30, WG3 comment #1, UPS-AT comments #16, Robert Manning's comment #3. and Lincoln Laboratory #1-h.)</p> <p>Non-concur comment: The MASPS material in this section on Long-term intent reporting is misleading in that the associated requirements are not yet mature and may very well change as the associated applications (e.g., ASAS) are further developed. Therefore, introductory text should be added to clearly indicate that the requirements associated with TC Reports may change as the requirements mature for the applications that will use TC Reports.</p> <p>WG6 Response: WG6 agrees that a caveat is needed in §2.1.2.19.2 similar to the one at the top of §3.4.9. However, WG6 feels that it is not appropriate to put such caveats in body text and recommends to plenary that the text remain in a note</p>	<p>Add the following as new second para. under 2.1.2.19.2:</p> <p>“The postulated requirements described below for long-term intent reporting may be revised in future editions of these MASPS as the requirements for the associated ADS-B applications mature. Implementations should not include specific provisions for long-term intent reporting until the associated application standards are mature.”</p> <p>WG6 Response: Add the following note to the top of §2.1.2.19.2: <i>“The postulated requirements described below for long-term intent reporting may be revised in future editions of these MASPS as the operational requirements mature. Early implementations should be aware that the requirements for the broadcast of long-term intent may be refined in future versions of this MASPS.”</i></p> <p style="text-align: right;">Beyond that, Referred to plenary.</p>
10*	Ron Jones	Table 2-2	56	<p>Non-concur comment: It is not known if ATS surveillance has a need to obtain TC Reports via ADS-B or not. Other more efficient and more reliable means may be available for ATS automation systems to obtain intent information, such as the use of address data link services (not involving ADS-B).</p> <p>WG6 Response: First, nothing should be done with TS reports since these are to be required in DO242A compliant ADS-B systems. Second, since this is a table of “expected” informational requirements to support example applications, the requested note is not needed.</p>	<p>Add a new note 4 under the table and reference to Note 4 for the final 3 entries in the table, in the column for ATS Surveillance. The proposed text for note 4 is: “ADS-B is one potential means to provide intent information to support ATS. Other alternatives mean may exist not involving ADS-B.”</p> <p>WG6 Response: The new Note would read as follows: “ADS-B is one potential means to provide intent information to support ATS. Other alternatives, not involving ADS-B may become available.” [Ron Jones concurs with this suggested resolution.]</p> <p style="text-align: right;">Accept with modification. / Done.</p>

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11	Ron Jones	2.2.3	60	It would be appropriate to include an additional final para. in this section to indicate that for security reasons, ATS in certain airspace is expected to require independent sources of surveillance information.	<p>Add a new para. at the bottom of page 60 to read: “Surveillance of air traffic plays a significant role in aviation security. For security reasons, ATS surveillance requirements in certain airspace may include a need for independent sources of surveillance information.”</p> <p>WG6 Response: The wording is accepted, but it will be included in a note, not body text.</p> <p style="text-align: right;">Accept with modification. / Done.</p>
12	Ron Jones	3.3.3.1 and Table 3-3	82-84	<p>The text of 3.3.3.1 and 3.3.1.1.1 discusses Table 3-4(a) but doesn’t discuss Tables 3.3(a) and 3-3(b). Thus no context is provided for these tables.</p> <p>WG6 Response: Tables 3-3(a) and 3-3(b) are discussed in §3.3.1 and 3.3.2, and should be moved a page or two forward in the document to be closer to the associated text.</p>	<p>Add text under 3.3.3.1 to discuss the meaning of the information presented in Tables 3-3(a) and 3-3(b).</p> <p>WG6 Response: As part of the final editing and formatting of DO-242A, these two tables will be moved closer to the associated text.</p> <p style="text-align: right;">Accepted. / Done</p>

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13*	Ron Jones	3.3.3.1.1	82	<p>(Also see comments 22 and 23, WG3 comment #4, Jerry Anderson comments 15, 22, and 23, and Lincoln Laboratory comment 1-i.)</p> <p>Non-concur comment: The 2nd sentence in the 2nd para. that starts “For the remaining 5%...” Is technically flawed and would represent a requirement that no real-world system could likely achieve. A 99% requirement on the final 5% of the users would in effect require on the order of 99.9% for the full population. This was not the intent of this statement.</p> <p>WG-6 Response: WG-6 agreed that the original sentence is technically flawed..</p>	<p>Remove this sentence from 3.3.3.1.1 and instead add the following note <i>“For the remainder of the user population that has not been acquired at the specified acquisition range, it is expected that those ADS-B participants will be acquired at the minimum ranges needed for safety applications. It is anticipated that certain of these safety applications that are applicable in en route and potentially certain terminal airspace, may require that 99% of the airborne ADS-B equipped target aircraft in the surrounding airspace are acquired at least 2 minutes in advance of a predicted time for closest point of approach. This assumes that the target aircraft will have been transmitting ADS-B for some minutes prior to the needed acquisition time and are within line-on-sight of the receiving aircraft.”</i></p> <p>WG-6 Response: Replace sentence with a note that reads as follows: <i>“For the remainder of the user population that has not been acquired at the specified acquisition range, it is expected that those ADS-B participants will be acquired at the minimum ranges needed for safety applications. It is anticipated that certain of these safety applications that are applicable in en route airspace (and potentially certain terminal airspace) may require that 99% of the airborne ADS-B equipped target aircraft in the surrounding airspace are acquired 2 minutes [2.5 minutes desired] in advance of a predicted time to closest point of approach. This assumes that the target aircraft will have been transmitting ADS-B for some minutes prior to the needed acquisition time and are within line-on-sight of the receiving aircraft.”</i> [Ron Jones and LL concurs with this resolution.]</p> <p style="text-align: right;">Accept with modifications. / Done.</p>
14	Ron Jones	Table 3-3(a) and Notes	83	<p>Add a note to indicate that ARV is not used under nominal conditions.</p> <p>WG6 Response: Whether ARV is required conditionally or only under certain conditions, the purpose of Table 3-3(a) is to specify what reports each equipage class needs to support from both the transmit and receive sides.</p>	<p>Add a note to indicate: “ARV are only used when valid ground reference velocity information in not available.”</p> <p>WG6 Response: No clarification note is needed. Do not accept this comment.</p> <p style="text-align: right;">Rejected.</p>

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15*	Ron Jones	Table 3-4(a)	86	The entries for the Required 99 th percentile MS acquisition range are not appropriate for the A3 case. The increase in probability from a 95% to a 99% values are related to range since the received signal strength and thus reception probability will increase as the range decreases. A reduction from 90 NM to 76 NM will probably not produce enough of an increase in signal strength to result in a probability of acquisition success from 95% to 99%. This is a link independent issue. Rather it relates a characteristic common to all links that results from antenna patterns and link budgets. An average increase in received power level of at least 3dB should be allowed to increase the acquisition probability from 95% to 99%. This 3 dB increase would be expected to occur at a range of 64 NM.	Change the entry for the 99 th percentile MS acquisition range to 64 nmi. (i.e., twice the 99% acquisition range for A2 receivers). WG-6 Response: Accepted with Modification (substitute “n/a” for 76 NM). (Ron Jones concurs with this response.) Done.
16*	Ron Jones	Table 3-4(a) Note 3	87	(Also see comment #32 and WG3 comment #2, and UPS-AT Comment #27.) Non-concur comment: The changes to note 3 are not correct as to the range requirements for the Port, Starboard and Aft directions. These changes do not agree with the analysis in Appendix H. (See attached white paper for more information)	Restore the range requirements for the Port, Starboard and Aft direction to those in DO-242 -OR- as an alternative add a more detailed specification of the range. If for example it is agreed that the minimum velocity for an aircraft participating in the en route flight path de-confliction application is 180 knots, a more complete set of requirements could be expressed as follow: <i>Note 3: The 90 NM (120 NM desired) range requirement applies in the forward direction. The required range +/- 45 degrees from forward is 64 NM (85 NM desired). The required range +/- 90 degrees from forward (i.e., port and starboard) is 45 NM (60 NM desired). The required range +/-45 degrees from aft is 35 NM (47 NM desired) and the required range aft is 32 NM (42 NM desired). (see Appendix H).</i> WG6 Response: Accept suggested resolution to UPS-AT comment #27 to clarify this requirement. [Ron Jones concurs.] Done.
17*	Ron Jones	Table 3-4(a) Note 10	87	(Also see Jerry Anderson comment #18.) Non-concur comment: This note is incorrect since MS update rates have not been defined.	Delete Note 10. WG6 Response: Agreed. Note 10 will be deleted. [Ron Jones concurs.] Accepted. / Done.

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18*	Ron Jones	Table 3-4(a) Note 11	88	<p>Non-concur comment: Final sentence of Note 11 is misleading as to the likelihood for the applicability of the range requirements for over-flight of high density terminal airspace. Longer range applications have not yet been shown to be practical in high density en route airspace. For Note 11, a more general statement could be made, not specifically linked to over-flights of high density terminal.</p> <p>WG6 Response: Also see Lincoln Laboratory Comment #1-f.</p>	<p>Replace the final sentence of Note 11 with: “As the requirements mature for the applications (e.g., ASAS) requiring long range air-to-air ADS-B reception, the definition of the applicable operational environment (e.g, operational traffic density) may change.”</p> <p>WG6 Response: Per Lincoln Laboratory comment #1-f resolution, change Note 11 to read as follows: “<i>Air-to-air ranges extending to 90 NM are intended to support the application of Flight Path Deconfliction Planning, Cooperative Separation in Oceanic/Los Density En Route Airspace, as described in Section 2.2.2.6. It is noted in Section 2.2.2.6, in connection with Table 2-3, that the operational concept and constraints associated with using ADS-B for separation assurance and sequencing have not been fully validated. It is possible that longer ranges may be necessary. Also, the minimum range required may apply even in high interference environments, such as over-flight of high traffic density terminal areas.</i>” [Ron Jones concurs with this resolution.]</p> <p style="text-align: right;">Accepted with modification. / Done.</p>
19*	Ron Jones	Table 3-4(a), Note 16	88	<p>Non-concur comment: The final sentence of this note appears to incorrectly state the relationship between required acquisition range and aircraft separation standards. Reduced separation standards, as postulated for the associated traffic scenario, could perhaps require longer acquisition ranges than for current separation standards and not the other way around.</p>	<p>In the final sentence of Note 16 change the text to read: “<u>Shorter</u> acquisition ranges are necessary for current separation standards.”</p> <p>WG-6 Response: <i>However, we did not reach agreement on the text of the Note. (Need to confer with Jonathan Hammer.)</i> [Ron Jones concurs.]</p> <p style="text-align: right;">Accepted with Modification.</p>

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20*	Ron Jones	3.3.3.1.2	89	<p>(Also see WG6 #4, Jerry Anderson #20, UPS-AT #29, Tony Warren #9, and Lincoln Laboratory #1-d.)</p> <p>Non-concur comment: The sentence in the 1st para.. that starts “For the remaining 5%...” over specifies the MS acquisition requirements. Table 3-4(a) specifies a 99% acquisition range and the text in this para. need not go any further.</p> <p>WG6 Response: Discussing 80% of the remaining 5% is all but equivalent to discussing a 99% requirement. However, the “remaining 5%” verbiage is preferred since it is more consistent with text from §3.3.3.1.1, 3.3.3.1.3, and 3.3.3.1.4.</p>	<p>Retain the 1st and 2nd sentences of the first para. as shown below and delete the remaining sentences of this para. Add a new 3rd sentence that would read: “Likewise Table 3-4(a) specifies the acquisition range at which 99% of the user population shall be acquired.”</p> <p>WG6 Response: (See consolidated response to WG6 comment #4.) [Ron Jones says that he concurs with this resolution.]</p> <p style="text-align: right;">Referred to plenary.</p>
21*	Ron Jones	Table 3-4(c) and 3.3.3.1.4	91-92	<p>(Also see WG3 comment #3.)</p> <p>Non-concur comment: No significant justification has been provided for the proposed 12 sec. update rate for TS Reports and TC+0 Reports at ranges to 40 NM following a change in information state. These update rates are very demanding and could result in significant impacts on the design of the ADS-B links and/or deduce the overall aircraft densities that can be supported by the given link. Since the MASPS are a minimum requirements document it is not appropriate to be including very demanding requirements based on speculation that some application at some point in the future might need such an update rate.</p> <p>WG6 Response: The justification for this requirement has been discussed numerous times with members from WG3, 5, and 6. It is suggested that this comment can not be resolved among the comment authors and WG6 and that all further discussion on this comment be at plenary.</p>	<p>For the rows labeled “TS Report state change update period” and “TC+0 state change update period” qualify all values as ‘desired’. Also in the text under 3.3.3.1.4 at the top of page 91, change the text to read “...the <u>desired</u> update period for A2 equipage within 40 NM and for A3 equipage” Further down in that same paragraph change Shall to Should (i.e., “The higher update rate <u>should</u>..” In the following para. change the text to read: “Table 3-4(c) shows the values for the required <u>and desired</u> minimum update...”</p> <p>WG-6 Resolution:</p> <p style="text-align: right;">Refer to SC-186 plenary.</p>

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22*	Ron Jones	3.3.3.1.3	89	<p>(Also see comments 13 and 23, WG3 comment #4, and Jerry Anderson comments 15, 22, and 23.)</p> <p>Non-concur comment: The sentence in the 1st para.. that starts “For the remaining 5%...” Is technically flawed and would represent a requirement that no real-world system could likely achieve. A 99% requirement on the final 5% of the users would in effect require on the order of 99.9% for the full population. This was not the intent of this statement.</p>	<p>Remove this sentence from 3.3.3.1.3 and instead add the following note “<i>For the remainder of the user population that has not been acquired at the specified acquisition range, it is expected that those ADS-B participants will be acquired at the minimum ranges needed for safety applications. It is anticipated that certain of these safety applications that are applicable in en route and potentially certain terminal airspace, may require that 99% of the airborne ADS-B equipped target aircraft in the surrounding airspace are acquired at least 2 minutes in advance of a predicted time for the when loss of required separation will occur. This assumes that the target aircraft will have been transmitting ADS-B for some minutes prior to the needed acquisition time and are within line-on-sight of the receiving aircraft.</i>”</p> <p>WG6 Response: Remove the sentence from §3.3.3.1.3, but do not add the suggested note. [This resolution is acceptable to Ron Jones.] Accepted with modifications. / Done.</p>
23*	Ron Jones	3.3.3.1.4	90	<p>(Also see comments 13 and 22, WG3 comment #4, and Jerry Anderson comments 15, 22, and 23.)</p> <p>Non-concur comment: The sentence in the 1st para.. that starts “For the remaining 5%...” Is technically flawed and would represent a requirement that no real-world system could likely achieve. A 99% requirement on the final 5% of the users would in effect require on the order of 99.9% for the full population. This was not the intent of this statement.</p>	<p>Remove this sentence from 3.3.3.1.4 and instead add the following note “<i>For the remainder of the user population that has not been acquired at the specified acquisition range, it is expected that those ADS-B participants will be acquired at the minimum ranges needed for safety applications. It is anticipated that certain of these safety applications that are applicable in en route and potentially certain terminal airspace, may require that 99% of the airborne ADS-B equipped target aircraft in the surrounding airspace are acquired at least 2 minutes in advance of a predicted time for the when loss of required separation will occur. This assumes that the target aircraft will have been transmitting ADS-B for some minutes prior to the needed acquisition time and are within line-on-sight of the receiving aircraft.</i>”</p> <p>WG6 Response: Resolve as per Ron Jones’ comment #13. [Ron Jones concurs.] Accepted with modifications. / Done.</p>

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24*	Ron Jones	3.3.4	94 - 95	Non-concur comment: There is one limitation of the TLAT LA2020 traffic scenario that needs to be recognized and that is it assumes a smooth earth model. It should be noted in the MASPS that adjustments to the vertical position of the aircraft in the traffic scenario to reflect actual terrain is appropriate.	Add the following note directly under the bullet at the top of page 95 related to altitude distribution : “Note: The TLAT LA2020 traffic scenario did not account for local terrain as it assumed a smooth earth model. For improved fidelity, adjustment of the aircraft altitudes in the traffic scenario is appropriate when used in conjunction with a link performance model that includes terrain.” WG6 Response: Agreed. <p style="text-align: right;">Accepted. / Done.</p>
25*	Ron Jones	3.4.2	101	Non-concur comment: A new requirement was added in the 4 th para. that states “..for each participant the report shall be updated and made available to ADS-B applications any time a new message containing all, or a portion of, it component information is received from a participant.” There needs to a lower bound placed on how often updated reports are required to be issued. In the case of 1090 ADS-B up to 4 state vector reports per second could be generated based on the stated requirement. However there is no technical or operational justification for this.	Change the requirement in the 4 th para. of 3.4.2 to read: “for each participant the report shall be updated and made available to ADS-B applications any time a new message containing all, or a portion of, it component information is received from a participant <u>with the exception that no type of report is required to be issued at a rate of greater than once per second.</u> ” <p style="text-align: right;">Accepted. / Done.</p>
26*	Ron Jones	3.4.3.2	106	Non-concur comment: Item (a) text states “A receiving ADS-B subsystem shall update the SV report that it provides to user applications about a transmitting participant whenever it receives messages from that participant providing updated information about any of the SV report elements.” This is a rewording of a requirement from DO-242. There needs to a lower bound placed on how often updated SV reports are required to be issued. In the case of 1090 ADS-B up to 4 state vector reports per second could be generated based on this requirement. However, there is no technical or operational justification for this issuing SV reports more often than once per second..	Change the requirement in the 4 th para. of 3.4.2 to read: “...whenever it receives messages from that participant providing updated information about any of the SV report elements <u>with the exception that SV reports are not required to be issued at a rate of greater than once per second.</u> ” <p style="text-align: right;">Accepted. / Done.</p>
27	Ron Jones	3.4.4.10.3	117	(Also see comment #27, WG5 comment #4, and Chris Moody comment #5) “Requesting ATC Services” should be “Receiving ATC Services”	Change “Requesting” to “Receiving” for each occurrence in this 3.4.4.10.3. WG6 Response: Agreed. See resolution for WG5 Comment #4. <p style="text-align: right;">Accepted. / Done.</p>

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28	Ron Jones	3.4.6	119	<p>(Also see Jerry Anderson comments 30, 35-39.)</p> <p>What is meant by “This report is not intended to assist in ADS-B applications.” If this is true then why is this report type defined? Also the idea of generating a SC report instead of MS or TC report when only specific state information has changed causes a conflict with the previously stated requirement of 3.4.2 that reports (i.e., includes MS or TC) must be updated when a message is received with any updated data elements.</p>	<p>Delete the sentence “This report is not intended to assist in ADS-B applications.” Add a second note to indicate if SC Reporting is implemented that an SC Report in lieu of a MS or TC report may be used as a means of satisfying the report update requirement of 3.4.2.</p> <p>WG6 Response: See WG6 response to Jerry Anderson Comment #30.</p> <p style="text-align: right;">Accepted. / Done.</p>
29*	Ron Jones	Table 3.4.7	121	<p>Non-concur comment: There is no justification given for requiring 4 bits for the address qualifier. In fact Note 1 indicates a single bit is considered sufficient to satisfy the ADS-B requirements stated in the MASPS. While allowing 4 bits in the report format could be acceptable the final statement in the note implies that ADS-B links should also provide 4 bits in ADS-B messages. This is not justified.</p> <p>WG6 Response: This requirement is in conflict with 2.1.2.2.2.2 which says minimum is 1 bit, but 4 are recommended.</p>	<p>Delete the final sentence (i.e., The number of bits shown....) of the Note as it is misleading and not valid as a general case.</p> <p>WG6 Response: Change requirement to be the minimum requirement – 1 bit – but add notes to all tables that show Address Qualifier as a report element suggesting 4 bits.</p> <p style="text-align: right;">Accepted with modification. / Done.</p>

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30*	Ron Jones	3.4.9	128	<p>(Also see comment #9 and WG3 comment #1, UPS-AT comments #16, Robert Manning's comment #3. and Lincoln Laboratory #1-h.)</p> <p>Non-concur comment: The MASPS material in this section does not clearly reflect the maturity of the requirements associated with TC Reports. The contents of Note 2 needs to be strengthened and placed in the introductory text of this section (i.e., not just in a note).</p> <p>WG6 Response: WG6 agrees that a caveat is needed warning against early implementation of TC+0 reports. However, WG6 feels that it is not appropriate specifically recommend not implementing these reports within the MASPS.</p>	<p>The following changes are proposed:</p> <ol style="list-style-type: none"> 1. Delete current Note 1 and make Note 2 simply Note. 2. Add the following new text as the first para. under 3.4.9: "The postulated requirements for Trajectory Change (TC) reports (TC+0, TC+n) are to be the subject of further validation within the context of the associated applications. Implementations should not include specific provisions for TC reports until the application standards are mature. The requirements for TC+0 reports defined herein may be revised in future versions of this MASPS." <p>WG6 Response: Referred to plenary. A candidate note modification was discussed, but not agreed to. WG6 feels plenary needs to determine if this material should be a note or body text, and that plenary will probably need to wordsmith this material. Change Note 1 of §3.4.9 to read as follows:: "<i>The postulated requirements for Trajectory Change (TC) reports (TC+0, TC+n) described below may be revised in future editions of these MASPS as the operational requirements mature. Early implementations should be aware that the requirements for TC+0 reports may be refined in future versions of this MASPS.</i>" Beyond this, Referred to plenary.</p>
31	Ron Jones	3.5.2.2	149	<p>Why were the DO-242 paragraphs 3.5.1.3.1 and 3.5.1.3.2 deleted from the DO-242A draft? It appears that these original paragraphs provided useful additional details on the requirements for aircraft onboard data sinks.</p>	<p>Restore text of DO-242 3.5.1.3.1 and 3.5.1.3.2.</p> <p style="text-align: right;">Accepted. / Done.</p>

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32	Ron Jones	App. H	H2	<p>(Also see comment #16, and WG3 comment #2, and UPS-AT comment #27.)</p> <p>Why was the slower moving aircraft velocity reduced to 120 knots for the overtake scenario. Since this is high altitude enroute airspace it seems quite unlikely that an aircraft participating in flight path de-confliction could be traveling that slow.</p> <p>WG6 Response: Ron and the WG-3 authors are correct in questioning the 120 knot minimum velocity in the overtake scenario. Personally, I think that a value of 180 knots would be more accurate, given the "high altitude en-route scenario". In that case, the difference in velocities between a 600 knot aircraft and a 180 knot aircraft is 7 nm/min. So, 7 nm/min * 4.5 min = 31.5 nm for this scenario. However, the 40 nm min A2 requirement dominates here and so the min "in-trail" requirement is 40 nm. Similarly, the "desired" value for longer ranges is 7 nm/min * 6 min = 42 nm. That is such a small increment that we might as well just not specify a "desired" value for the "in-trail" scenario, i.e. just use the 40 nm minimum in this encounter direction.</p>	<p>Restore original values from DO-242 Appendix H for the slower aircraft velocity in the overtake scenario and restore the original calculations as to the required aft reception range –or- as an alternative define the velocity for the slower moving aircraft as 180 knots and change the aft range requirement to 31.5 NM. See <u>Attachment WG3-1</u> below. Also see comment 16 above.</p> <p>WG6 Response: Accept suggested resolution to UPS-AT comment #27, and similarly clarify material in Appendix H.</p> <p style="text-align: right;">Accepted. / Done.</p>

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1	Rick Cassell	3.4.4.6	114	<p>In the definition of the classes for aircraft length and width (Table 3.4.4.6) there is a problem with class 0 having a range for fuselage length from 0 to 30 m. This is too large for a single class. The ranges for the other classes are only 8 m. This results in the maximum error in estimation of fuselage length equal to 15 m. Whereas for the other categories the max error is 4 m. There are a significant number of aircraft with lengths less than 30 m. The current grouping results in everything from the smallest general aviation aircraft to small commercial aircraft (Fokker 28, Gulfstream 5, BAC 146) being in the same category. With this size definition the impact will be either increased false alerts or late alerts in runway incursion alerting. False alerts would occur if the fuselage length is overestimated at 30 m for a small aircraft. Late alerts would occur if the fuselage length is underestimated to be 15 m, when it is actually 30 m length. Since pilots and controllers will not accept a high number of false alerts, runway incursion algorithms would have to assume shorter fuselage lengths and resulting late alerts.</p>	<p>The recommendation is to increase the range for each class from 8 m to 10 m, thus reducing the smallest class length. The proposal is shown in a revised Table 3.4.4.6.</p> <p>This will significantly reduce the possible differences in length for the smaller planes, while having minimal impact on differences for the larger size classes. The max error for class 0 would be ± 5 m, since few planes are shorter than 5 m. Similarly, the max error for all other categories would be ± 5 m.</p> <p>This change will simplify the design and improve the performance of runway incursion alerting systems, since the magnitude of error in estimating aircraft length will be approximately the same for all sizes.</p> <p>There are some related changes that need to be made in the wingspan classes to match the changes to the fuselage classes. Recommended changes to wingspan classes are included as well.</p> <div><p>Table 3.4.4.6 (Revised)</p><table><tr><th colspan="3">Length Code (3 MSBs)</th><th colspan="2">Width (Wingspan) Code (LSB)</th></tr><tr><th>dec.</th><th>Binary</th><th>Length Category</th><th>Narrow (LSB = 0)</th><th>Wide (LSB = 1)</th></tr><tr><td>0</td><td>000</td><td>$L < 15$</td><td>$W < 15$</td><td>$15 \leq W < 23$</td></tr><tr><td>1</td><td>001</td><td>$L < 25$</td><td>$W < 23$</td><td>$23 \leq W < 33$</td></tr><tr><td>2</td><td>010</td><td>$L < 35$</td><td>$W < 28$</td><td>$28 \leq W < 38$</td></tr><tr><td>3</td><td>011</td><td>$L < 45$</td><td>$W < 38$</td><td>$38 \leq W < 48$</td></tr><tr><td>4</td><td>100</td><td>$L < 55$</td><td>$W < 42$</td><td>$42 \leq W < 52$</td></tr><tr><td>5</td><td>101</td><td>$L < 65$</td><td>$W < 52$</td><td>$52 \leq W < 65$</td></tr><tr><td>6</td><td>110</td><td>$L < 75$</td><td>$W < 70$</td><td>$70 \leq W < 80$</td></tr><tr><td>7</td><td>111</td><td>$L \geq 75$</td><td>$W < 84$</td><td>$W \geq 84$</td></tr></table></div> <p>WG6 Response: Requirement for which size codes must report position with respect to ADS-B reference point must be reevaluated.</p> <p>Accepted with modifications. / Done.</p>	Length Code (3 MSBs)			Width (Wingspan) Code (LSB)		dec.	Binary	Length Category	Narrow (LSB = 0)	Wide (LSB = 1)	0	000	$L < 15$	$W < 15$	$15 \leq W < 23$	1	001	$L < 25$	$W < 23$	$23 \leq W < 33$	2	010	$L < 35$	$W < 28$	$28 \leq W < 38$	3	011	$L < 45$	$W < 38$	$38 \leq W < 48$	4	100	$L < 55$	$W < 42$	$42 \leq W < 52$	5	101	$L < 65$	$W < 52$	$52 \leq W < 65$	6	110	$L < 75$	$W < 70$	$70 \leq W < 80$	7	111	$L \geq 75$	$W < 84$	$W \geq 84$
Length Code (3 MSBs)			Width (Wingspan) Code (LSB)																																																				
dec.	Binary	Length Category	Narrow (LSB = 0)	Wide (LSB = 1)																																																			
0	000	$L < 15$	$W < 15$	$15 \leq W < 23$																																																			
1	001	$L < 25$	$W < 23$	$23 \leq W < 33$																																																			
2	010	$L < 35$	$W < 28$	$28 \leq W < 38$																																																			
3	011	$L < 45$	$W < 38$	$38 \leq W < 48$																																																			
4	100	$L < 55$	$W < 42$	$42 \leq W < 52$																																																			
5	101	$L < 65$	$W < 52$	$52 \leq W < 65$																																																			
6	110	$L < 75$	$W < 70$	$70 \leq W < 80$																																																			
7	111	$L \geq 75$	$W < 84$	$W \geq 84$																																																			

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1	C. Varner, Mitre / CAASD	2.1.2.12	34	The LAAS Protection level is a containment boundary having the following condition: The probability that the absolute value of the true error is larger than the protection level for a period greater than the time to alert without an alert being issued is less than or equal to the integrity risk. This is not exactly the same as the surveillance integrity level (SIL), which does not associate integrity with a Time to Alert constraint. For Cat I LAAS, the time to alert is 3 seconds. For Cat II/III systems, the time to alert is 1 second. Cat II/III systems will be compliant with if ADS-B bases its SIL parameter on a 3-second time to alert. If the SIL is based on a time a time to alert that is less than 3 seconds, then Cat I LAAS will not comply with the SIL requirements.	Recommend that relevant portion of Section 2.1.2.12 be modified as follows: ... The SIL parameter specifies the probability of the true position lying outside the containment radius for more than 3 seconds without alerting, ... WG6 Response: For a surveillance system what is important is what the SIL value is <u>now</u> , not for how long that SIL value will remain unchanged. Rejected.
2	C. Varner, Mitre / CAASD	2.1.2.15	37	Same as Comment 1	Recommend that relevant portion of Section 2.1.2.15 be modified as follows: ... NIC parameter (§ 2.1.2.12) being exceed for more than 3 seconds, without alerting, ... WG6 Response: For a surveillance system what is important is what the NIC value is <u>now</u> , not for how long that NIC value will remain unchanged. Rejected.
3	C. Varner, Mitre / CAASD	2.1.2.14	37	LAAS does not output a NACv value. If the ADS-B equipment knows that LAAS is the source of the navigation positioning information, then the ADS-B equipment can calculate a NACv value from other output parameters and algorithms given in Appendix F of the LAAS MOPS. If ADS-B equipment does not know what source is supplying the positioning data, then a default value for NACv may be considered. For the later case: if a default value cannot supply sufficient integrity for practical ADS-B operations, then the outputs of a minimum LAAS receiver are not compliant with ADS-B needs.	Recommendation: Depends upon ADS-B capabilities and needs (See comment for suggestions). WG6 Response: The appendix from DO-260 will be included in DO-242A. Accept with modification.

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#	Author	Section	Page	Comment	Suggested Resolution
1	Tony Warren	2.1.2.12 2.1.2.13	34 36	There are no NIC categories reserved for future growth. (Same comment for NACp)	Add several NIC categories as “reserved” WG6 Response: Operational needs for tighter values of NIC and NAC are unforeseen. Rejected.
2	Tony Warren	2.1.2.14	37	Vertical Velocity Error column in Table 2.1.2.14 only refers to “Geometric” velocity	Delete the word “Geometric” from the column heading or add a note as to why Baro vertical rate is not included in NACv. WG6 Response: A note will be added stating that NAC _v does not apply to barometric velocity accuracy. Accepted. / Done.
3	Tony Warren	2.1.2.19 .2	41	First sentence of the first paragraph is not quite correct since it seems to imply that a single TC+0 report is not Long Term Intent	Between “aircraft trajectory” and “beyond the current flight segment” add the phrase “including trajectory change point for the current flight segment and for intent specification” WG6 Response: Editorial. Accepted. /Done.
4	Tony Warren	2.2.2	47	Figure 2-2 does not include the desired 50 nm acquisition range for A2 equipage	Add a 50 nm range ring to Figure 2-2 WG6 Response: Accepted. /Done
5	Tony Warren	2.2.2	57	Non-concur comment: The 2 minute alert time specified for Separation Assurance and Sequencing in Table 2-3 is probably insufficient time margin for conflict resolution, if this is interpreted as a 95% alerting requirement. The time margin for this function needs to incorporate at least the following functions: 1) Time to acquire and detect a conflicting aircraft with high probability, 2) Time for pilot to react and begin avoidance maneuver, 3) Time for maneuver to result in safe separation. The time period for 1) and 2) can be on the order of a minute or more, severely reducing the time available for conflict avoidance. WG6 Response:	Two possible resolutions are suggested: <ul style="list-style-type: none"> a) Specify the 2 minute alerting time with high probability, e.g. 99% or better; b) Increase the required (95%) alerting time to 2.5 minutes to allow for probable reductions in conflict resolution time. <p>Note: the alert time threshold is directly tied to the required acquisition range in row 1.</p> <p>(See the response to Ron Jones’ comment #13 above.) WG-6 Response: Reject the two proposed resolutions as premature. Warn implementers with the <i>Note</i> described above for Ron Jones’ comment #13 and place on list on items to be considered for the forthcoming ASA MASPS and for DO-242B. [Tony Warren concurs with this proposed resolution.] Rejected.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
6	Tony Warren	2.2.2	57	Note 8 seems to be misplaced	Delete note or fix the reference to note 8. WG6 Response: Editorial. Accepted. / Done.
7	Tony Warren	3.3.3.1.1	82	The time margins for conflict detection and resolution are barely adequate if the receiving aircraft has detected a conflict at 40 nm range in a head-on scenario. If an A2 receiving aircraft has not acquired a conflicting aircraft at the 40 nm acquisition range, then some means to assure high probability of acquisition shortly thereafter is required, or the margins for conflict resolution may be insufficient to prevent a separation violation, or may force a large increase in pilot workload to prevent a separation violation. WG6 Response:	Best resolution is to adopt #5 above. Else, strengthen the statement in the second paragraph, second sentence to say “For the remaining 5% of the user population that has not been acquired at the 95% specified range, they shall be acquired with high probability (99%) within the coast interval specified in Table 3-4(a), for any safety critical operation . WG6 Response: Referred to plenary.
8	Tony Warren	3.3.3.1.1	86	Some of the Mode Status variables such as NACp and SIL are needed to perform conflict detection and resolution functions. The 34 nm requirement for 99% MS acquisition range for Level A2 systems is inadequate to guarantee a 2 minute acquisition and alert time, i.e. 34 nm is equivalent to about 1.7 min = 102 seconds to CPA in worst case, head-on encounters.	Best resolution is to adopt #5 above. Else, add a note in this column warning implementers that this requirement could be strengthened in future MASPS versions, e.g. it may be necessary to meet a 2 minute alerting time requirement with 99% probability for critical conflict detection applications. WG6 Response: Referred to plenary.
9	Tony Warren	3.3.3.1.2	89	(Also see WG6 #4, Jerry Anderson #20, Ron Jones #20, UPS-AT #29, and Lincoln Laboratory #1-d.) In the case of aircraft that do not acquire MS at the 95% acquisition range, the requirement to acquire by the reduced range needs to be strengthened to apply to a high probability of such aircraft, e.g. 90% of those not meeting the 95% acquisition range should meet the reduced range requirement. This is to have some margin for meeting conflict detection probability criteria, e.g. 99% probability of conflict alerting for critical separation apps.	Make the requirement a 99.5 % acquisition range requirement for critical applications at the reduced range. Specifically, strengthen the 3 rd sentence of the first paragraph to say “ For the remaining 5% of the user population that has not been acquired at the 95% specified range, they shall be acquired with high probability (90%) within the MS reduced acquisition range specified in Table 3-4(a), for safety critical operations WG6 Response: See consolidated response to WG6 comment #4. Referred to plenary.

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#	Author	Section	Page	Comment	Suggested Resolution
10	Tony Warren	3.4.7	121	<p>Non-concur comment: The current use of Air-reference velocity reports as a backup for surveillance when ground-referenced data becomes unavailable is deficient. For this reason, and for other benefits, the broadcasting of ARV reports is needed at low rates on a consistent basis.</p> <p>This issue is further documented in IP63</p> <p>WG6 Response: Issue Paper 63 was submitted to WG6 only two weeks prior to the delivery date of the draft ADS-B MASPS. Previously WG6 and members of WG4 agreed that a substantial analysis effort would be needed to determine what the allowable minimum update rates of ARV reports need to be, and that there was not the time or resources available to do that work within the schedule of DO-242A.</p>	<p>Recommend incorporating IP63 into DO-242A.</p> <p>WG6 Response: WG6 deferred Issue Paper 63 primarily because of lack of resources and the schedule of DO-242A. WG6 fully endorses examination and possible acceptance of IP63 for Rev B incorporation.</p> <p>Plenary Agreement: Plenary agreed to remove the loss of ground data as a condition which would require the transmission of ARV report messages.</p> <p style="text-align: right;">Referred to plenary. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1	Sethu Rathinam, RC			<i>Sufficiency of validation of the requirements and values specified in the MASPS.</i> While DO-242A reflects continued refinement in the information content and data elements and associated numerical requirements over the initial MASPS, there is still a need for greater maturity of validation of the requirements and definition of anticipated end user applications. As the various SC-186 standards mature (eg, ASA MASPS, TIS-B MASPS) and become available, it is expected that DO-242 Rev A requirements will undergo additional validation and become more mature. .	Some changes will likely be needed in a future revision of the ADS-B MASPS WG6 Response: No action required.
2	Sethu Rathinam, RC			<i>Maturity of trajectory related requirements:</i> We agree with the statement (quoted from Hal Moses’ e-mail from 7 Mar 2002) “The SC186 leadership recommends that the plenary direct that TC reports, while defined in the body of DO242A, not be implemented in DO260A and the upcoming UAT MOPS until further validation of TC report requirements is accomplished. Instead, the leadership recommends that the plenary adopt, as a MOPS approval requirement, that both link MOPS document specific analyses demonstrating system performance with TC reports in low and high density airspace using the LAX 2020 scenario. These analyses should use the DO-242A specified requirements for TC+0 reports and should show the system capacity supporting additional TC+n reports in terms of supported update rate, and message content.” .	We recommend the thoughts in items (1) and (2) be captured in a note in DO-242A for the benefit of readers that do not come to the SC-186 meetings WG6 Response: Referred to plenary.
3	Sethu Rathinam, RC			<i>SC-186 deals with surveillance sensors and related requirements.</i> SC-159 deals with navigation related requirements. SC-181 deals with RNP requirements. SC-193 deals with database requirements. The Surveillance Applications being envisioned touch all these areas. Currently, the Navigation area is more mature (from an avionics perspective) than the Surveillance area, and hence has controlled the avionics system (eg., the multi-mode receiver with GPS, ILS and MLS) requirements. Such requirements address a navigation or guidance path as opposed to a position – but surveillance requirements are primarily based on position (and velocity etc). . Also, SC-186 implicitly talks about Navigation Sensors (and assumes that these are Surveillance Sensors). requirements in the “boxes” that support navigation.	There needs to be additional coordination between SC-186 and the other committees named above, so the POSITION requirements are captured and implemented, in addition to the PATH/DEVIATION requirements We see the need to clearly acknowledge (in the MASPS document) the different slants and the differences in the objectives of Navigation vs Surveillance sensors. This coordination will also promote the implementation of the surveillance related WG6 Response: No action required.

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#	Author	Section	Page	Comment	Suggested Resolution
1	Tom Mosher, UPS AT	1.2.6, 1.3.2.1 (item 3)	13, 19	Inconsistent use of “flight identification,” “flight ID,” where “call sign” is used throughout the body of the document	Replace “flight identification” and “flight ID” with “Call Sign” throughout the document. WG6 Response: Editorial. Accepted. / Done.
2	Tom Mosher, UPS AT	2.1.2.1	26	“Time of Applicability” has different resolution for SV (0.2 seconds) than MS reports (1.0 seconds), but this important distinction is not mentioned in the Report Characteristics description.	Add the following <i>Note</i> to 2.1.2.1: <i>Note:</i> The required resolution of the Time of Applicability value is a function of the Report Type. WG6 Response: Accepted. / Done.
3	James Maynard, UPS AT	2.1.2.5	30	We should not <i>now</i> require every aircraft over a certain size to transmit the position of its ADS-B reference point (center of aircraft), especially since we don’t yet have a operational description to support such a requirement. Stu’s thought: Don’t we at least want to keep as desired that all A/V with a length code of 2 or greater when reporting a NAC of 10 or greater report position with respect to Nav. Ref. Pt.?? WG6 Concern: The “new” requirement on limiting NAC values if A/V does not broadcast position relative to ADS-B Reference Point is outside the scope of ADS-B Transmitting systems. REMEDY: A note similar to that for reference point needs to accompany the new requirement on NAC.	Relax that requirement (R2.17 in §2.2.5) by having it apply only when a new CC bit (§3.4.4.9) is set. (By setting that bit, the transmitting ADS-B participant would be announcing that the position it is transmitting is the position of its ADS-B position reference point, rather than the position of its GPS antenna.) See Attachment UPS-AT-1 to these comments for an argument as to why this change is desirable, and Attachment UPS-AT-2 for proposed text changes that would implement the change. WG6 Response: In addition to the proposed addition of the CC code for ability to transmit position corrected to ADS-B Navigation reference point, the note in 2.1.2.5 discussing the determination of NACp be a function of the ability to transmit corrected position data will be elevated to body text as a requirement. Accepted with modification. / Done.
4	Tom Mosher, UPS AT	2.1.2.5	31	The <i>Note</i> under <u>Figure 2.1.2.5</u> is perhaps confusing because of the phrase “with respect to the body of the aircraft,” which might be construed to be “with respect to the fuselage.”	Delete the phrase “with respect to the body of the aircraft” from that note. WG6 Response: Editorial. Accepted. /Done.

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#	Author	Section	Page	Comment	Suggested Resolution
5	James Maynard, UPS AT	2.1.2.5	30-31	(See Attachment UPS-AT-1.)	<p>The ADS-B position reference point should <i>not</i> be the center of the smallest rectangle that circumscribes the aircraft. Rather, it should be the center of the rectangle that describes the largest possible horizontal extent of the aircraft, as determined by the length and width codes that it transmits.</p> <p>WG6 Response: Position the larger rectangle with the nose of the aircraft touching one side and the wingspan centered. Accepted with modification. / Done.</p>
6	Steve Horvath, UPS AT	2.1.2.6	31	Avoid the verb “report” when it does not refer to a particular ADS-B report.	<p>Change “reported” to “provided” in the first sentence. Please clarify here (and elsewhere!) whether “reported” refers to transmitting or receiving ADS-B subsystems.</p> <p>WG6 Response: Editorial. Accepted. / Partially Done.</p>
7	Tom Mosher, UPS AT	2.1.2.6	31	The <i>Note</i> at the bottom of the page is not really appropriate to reporting altitude, but to reporting velocity.	<p>Move that note from §2.1.2.6 to just before the last paragraph of §2.1.2.7.</p> <p>WG6 Response: Editorial. Accepted. / Done.</p>
8	Tom Mosher, UPS AT	2.1.2.6	~31	In the DO-242A errata sheet from the web page, correction #3: the proposed text should be more explicit about requiring an interface to the pilot, without seeming to specify the sense of a bit at that interface. The last sentence of the proposed new text is confusing and should not create a new requirement for an additional validity bit.	<p>Strike the last sentence from correction #3.</p> <p>WG6 Response: Editorial. Accepted. / Done.</p>
9	Steve Horvath, UPS AT	2.1.2.6.1	32		<p>Editorial: Insert “be” after (R2.20).</p> <p>Accepted. / Done.</p>
10	Tom Mosher, UPS AT	2.1.2.8	32	<i>Note 1</i> should mention vertical rate rather than horizontal velocity.	<p>Change “horizontal velocity” to “vertical rate” in <i>Note 1</i>.</p> <p>WG6 Response: Editorial. Accepted. / Done.</p>
11	Steve Horvath, UPS AT	2.1.2.8	33	Concerning the last paragraph, I’m not at all sure that the “best source of altitude rate” would be the geometric altitude rate rather than the pressure altitude rate.	<p>We need an explicit requirement that describes what is “the best available source of altitude rate information.”</p> <p>WG6 Response: An Issue Paper should be submitted on this topic asking for development of criteria and discussions about when mixed sources from multiple aircraft are being broadcast. Rejected.</p>

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12	Steve Horvath, UPS AT	2.1.2.12	34	If NIC is supposed to describe the integrity of geometric position only, say so.	In the first sentence of §2.1.2.12, replace “reported position” with “reported geometric position.” WG6 Response: Editorial. Accepted. / Done.
13	Steve Horvath, UPS AT	2.1.2.12	34	Why do we not have vertical integrity bounds described for most NIC values?	Add a note that answers this question. WG6 Response: Editorial. Accepted.
14	Steve Horvath, UPS AT	2.1.2.13	35	If NAC _p is supposed to describe the accuracy of geometric position only, say so.	In the first sentence of §2.1.2.13, replace “reported position” with “reported geometric position.” WG6 Response: Editorial. Accepted. / Done.
15	Steve Horvath, UPS AT	2.1.2.13	35	Why do we not have vertical accuracy bounds described for most NAC _p values?	Add a note that answers this question. WG6 Response: Editorial. Accepted.
16	Steve Horvath, UPS AT	2.1.2.19.2	44	The requirements R2.35 (R2.36) that equipage class A2 (A3) provides messages to support the TC+0 report (TC+n reports) is not <u>really</u> a requirement if SC-186 directs WG-3 and WG-5 not to support it in their MOPS. Since a reader of DO-242A will have only the text of DO-242A before him or her, and not the cover letter distributed with the ballot draft, the text of DO-242A should relax this requirement.	Replace this requirement with a comment, or add a note, to the effect that at the time this MASPS was approved, it was expected that the MOPS that define the messages on particular ADS-B data links would not support this requirement in the MASPS. WG6 Response: Referred to plenary
17	Tom Mosher, UPS AT	2.2.3	59	In Table 2-4a, the cell in the “Operational Domain Radius” row and “Parallel Runway Conformance Monitoring” column says “30 NM, or the point where the aircraft intercepts the final approach coarse,” but doesn’t state whether it is the smaller or the larger of these two values that governs.	Specify either the greater, or the lesser, of the two values. (Probably the greater?) WG6 Response: Editorial. The lesser of the two values is to be used. Accepted. / Done.
18	Tom Mosher, UPS AT	xxx	69	Page is blank.	Make it not blank, or state “intentionally left blank.” WG6 Response: Editorial. Accepted. / Done.

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19	Tom Mosher, UPS AT	3.2.3.2 , Table 3-1, 3.3.1, 3.5.2	76, 77, 79, 147	Occasional use of “obstruction,” where “obstacle” is used commonly throughout the document.	Replace “obstruction” with “obstacle” in 6 places in the document. WG6 Response: Editorial. Accepted. / Done.
20	Tom Mosher, UPS AT	3.2.3.2	77	In <u>Table 3-1</u> , the cell giving comments for class C2, does not specify whether to use the larger or smaller of the two values.	Same as for comment #15 above. WG6 Response: Editorial. Accepted. / Done.
21	Tom Mosher, UPS AT	3.2.3.3	78	The description of Class C3 should specify that it is for ADS-B receiving subsystems on the ground.	Do so. WG6 Response: Editorial. Accepted. / Done.
22	Tom Mosher, UPS AT	3.3.1	79	(Also see WG5 comment #99 and Jerry Anderson comment #6.) In the third paragraph of §3.3.1, class B1 transmitting subsystems are described as meeting certain requirements of A0, A1, or <u>A2</u> equipment. This seems to be the only place where B1 is associated with class A2 requirements.	Delete the reference to equipage class A2. WG6 Response: (See WG5 comment #6.) Accepted. / Done.
23	Tom Mosher and Robert Grove, UPS AT	3.3.1	79	Requirement (R3.5), which requires that ground vehicles should automatically determine whether or not they are within the aircraft surface movement area (runways and taxiways). This requirement will be difficult to meet. This MASPS requirement appears to be driven by a data-link specific spectrum issue. Such data-link specific requirements do not belong in the MASPS.	Delete this requirement, or at least delete the word “automatically” from it. WG6 Response: FAA Spectrum engineering reported that this requirement is needed due to spectrum constraints. Plenary reaction: After discussion at plenary, it was agreed to reword the sentence as follows: If required due to spectrum considerations, ADS-B transmissions from ground vehicles (class B2) shall (R3.5) be automatically prohibited when those vehicles are outside the surface movement area (i.e., runways and taxiways). Accepted with modifications / Done.

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24	Tom Mosher, UPS AT	3.3.2	81	The <i>Note</i> to <u>Table 3-2(a)</u> allows range requirements in nautical miles to vary according to the target's relative bearing for equipage class A3, but not for equipage class A2. That seems strange – should the requirements that vary by relative bearing apply to class A2 also?	Verify that the <i>Note</i> is intended to apply only to class A3. WG6 Response: This note needs to be updated so that it is consistent with Note 3 of Table 3-4(a) as agreed to in UPS-AT comment #27.. Accepted with modification. / Done.
25	Tom Mosher, UPS AT	3.3.2	83	What do “support” and “perform” mean in <u>Table 3-3(a)</u> and <u>(b)</u> ?	Need to define these terms. Without clear definitions, the tables fail to convey any requirements. WG6 Response: Editorial. Accepted.
26	Tom Mosher, UPS AT	3.3.3.1.1	86	In the “Equipage Class” row of Table 3-4(a), “B2” should be omitted from the first and second columns, since class B2 has range requirements only to 5 NM.	Change “B1-B3” in these cells to read “B1, B3.” WG6 Response: Editorial. Accepted. / Done.
27	James Maynard, UPS AT	3.3.3.1.1	87	(Also see WG6 comment #6, WG3 comment #2, Ron Jones comments 16 & 32, and UPS-AT comment 27 & 28.) We have discovered (experimentally, as usual!) an ambiguity in <i>Note 3</i> to <u>Table 3-4(a)</u> . Does the phrase “90 degrees to port and starboard” refer to the relative bearing of the other aircraft with respect to own-aircraft’s heading, or does it refer to the “encounter angle” between the ground tracks of the two aircraft? I believe that “90 degrees to port and starboard” should mean the relative bearing of the target aircraft with respect to the own aircraft’s heading.	Reword <i>Note 3</i> to <u>Table 3-4(a)</u> to read as follows: 3. <i>The 90 NM range requirement applies in the forward direction (that is, the direction of the own aircraft’s heading). The required range aft is 40 NM. The required range 45 degrees to port and starboard of the own aircraft's heading is 64 NM (see Appendix H). The required range 90 degrees to port and starboard of the own aircraft’s heading is 45 NM. [The 120 NM desired range applies in the forward direction. The desired range aft is 42 NM. The desired range 45 degrees to port and starboard of the own-aircraft’s heading is 85 NM.]</i> WG-6 Response: Desired aft range is changed to 42 NM. Accepted with Modifications. / Done.

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28	James Maynard, UPS AT	3.3.3.1.1	87	(Also see WG6 comment #6, WG3 comment #2, Ron Jones comments 16 & 32, and UPS-AT comment 27 & 28.) <i>Note 3</i> to <u>Table 3-4(a)</u> purports to describe requirements. Requirements should not be stated in <i>Notes</i> .	Let <i>Note 3</i> refer to a requirement, and let the requirement itself be stated in body text. WG-6 Response: There is already a requirement in the text, which references the table, which in turn references this <i>Note</i> . Rejected.
29	Tom Mosher, UPS AT	3.3.3.1.2	89	(Also see WG6 #4, Jerry Anderson #20, Ron Jones #20, Tony Warren #9, and Lincoln Laboratory #1-d.) The last sentence of the first paragraph is not stated with a “shall” so is presumably not a requirement. Is this right?	This last sentence might need to be re-worded, or a <i>Note</i> added, to clarify that it does <i>not</i> impose a requirement, and possibly to explain why not. WG-6 Response: See consolidated response to WG6 comment #4. Accepted with modification. / Done.
30	Tom Mosher, UPS AT	3.3.3.1.3	89	In <u>Table 3-4(b)</u> , there is nothing filled in for ARV acquisition range for ranges below 10 NM. Is there a required acquisition range here?	Fill in “10 NM” in this cell, if that is what is to be required. If there is no requirement, state “no minimum acquisition range required.” WG6 Response: Editorial. The minimum acquisition range for ARV reports for A1 equipage is 20 NM which is shown in the next column. Therefore, clarification is needed with a note. Accepted. / Done.
31	Tom Mosher, UPS AT	3.3.3.2.2 (and 3.4.3.6, etc.)	94	(Also see WG5 comment #7.) If NAC_P is not known, but NIC is known, what is the SV latency requirement? In general, where requirements depend on NAC_P now (rather than on NUC_P) what is the requirement when NAC_P is unknown?	?? WG-6 Response: Plenary Discussion: Accepted with modifications. Rejected Done.
32	Tom Mosher, UPS AT	3.3.4	94	The paragraph below the <i>Note</i> refers to the “LA2020 curve” in <u>Figure 3-8</u> . But there are two such curves; which one is meant?	Clarify! WG6 Response: Editorial. Accepted. / Done.

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33	Tom Mosher, UPS AT	3.4.3.3	106	Requirement for SV TOA resolution of 0.2 seconds is not stated explicitly, as implied by <u>Table 3.4.3</u> .	Add a <i>Note</i> that the recommended TOA resolution of 0.2 seconds would meet the requirements of §3.4.3.3 items a, b, and c. WG6 Response: Editorial. Accepted. / Done.
34	James Maynard, UPS AT	3.4.4	112	The ARV report capability flag of §3.4.4.9.4 has been omitted from <u>Table 3.4.4</u> .	Add ARV report capability flag to <u>Table 3.4.4</u> as MS report element #7d. Renumber the TS report capability flag as element #7e and the TC report capability level as element #7f. Decrease the number of CC codes reserved for future growth from 7 to 6. WG6 Response: Editorial. Accepted. / Done.
35	James Maynard, UPS AT	3.4.4	112	The order of the first two capability (CC) codes is reversed from the order already established in DO-260. [This is a minor editorial comment, but will help to align the order of the CC bits in the MASPS with the order of the fields already defined to carry these bits in the 1090 MOPS.]	In <u>Table 3.4.4</u> , reverse the order of the “TCAS/ACAS installed and operational” and “CDTI display capability” capability codes, presenting the TCAS/ACAS flag first, as element #7a, and the CDTI capability flag as element #7b. Likewise, swap the order of the corresponding subparagraphs, §3.3.4.9.1 and §3.3.4.9.2. WG6 Response: Editorial. Accepted. / Done.
36	James Maynard, UPS AT	3.4.4	112	<i>Note 2</i> to <u>Table 3.4.4</u> says “See section 2.1.2.3 for details,” but the details are not to be found there.	Change the note to reference §3.4.4.6 instead of §2.1.2.3. WG6 Response: Editorial. Accepted. / Done.

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#	Author	Section	Page	Comment	Suggested Resolution
37	James Maynard, UPS AT	3.4.4.9.2	115	<p>The meaning of the “TCAS/ACAS Installed and Operational” CC code differs from that already defined for this code in DO-260.</p> <p>The meaning as already defined in DO-260 is plausible. For reasons of backward compatibility, it is very important that we <i>do not</i> define it differently in DO-242A.</p>	<p>Change the text to read as follows:</p> <p>“The CC code for ‘TCAS/ACAS installed an operational’ shall (R3.106-A) be set to ONE if the transmitting aircraft is fitted with a TCAS II or ACAS computer and that computer is turned on and operating in a mode that can generate Resolution Advisory (RA) alerts. Likewise, this CC code shall (R3.106-B) be set to one if the transmitting ADS-B equipment cannot ascertain whether or not a TCAS II or ACAS computer is installed, or cannot ascertain whether that computer, if installed, is operating in a mode that can generate RA alerts. Otherwise, this CC code shall (R3.106-C) be ZERO.</p> <p><i>“Note: A value of ONE is intended to signal a receiving application that if it is necessary to avoid the transmitting aircraft, this should be done by horizontal rather than vertical maneuvers, because a Resolution Advisory from TCAS II or ACAS will advise the pilot to maneuver vertically. If it is unknown whether or not the transmitting aircraft has TCAS, it should set this CC code to ONE so that receiving aircraft will be more likely to use horizontal than vertical maneuvers if necessary to avoid the transmitting aircraft.”</i></p> <p>WG6 Response:</p> <p style="text-align: right;">Accepted. / Done.</p>
38	James Maynard, UPS AT	3.4.4, 3.4.4.9		Need a CC code to announce that an aircraft is transmitting the location of its ADS-B position reference point. (See Attachment UPS-AT-1 for the rationale.)	<p>Add a CC bit that announces that the aircraft is transmitting the position of its ADS-B reference point (e.g., middle of aircraft) rather than another position (e.g., the position of its GPS antenna). Modify the requirements to transmit the position of the ADS-B reference point so that they apply only when this new CC bit is set to ONE. (See Attachment UPS-AT-2 for draft text.)</p> <p style="text-align: right;">Accepted. / Done.</p>
39	Steve Horvath, UPS AT	3.4.4.9.1	115	If a CDTI-capable display is installed on an aircraft, but that display is not currently in a mode in which it actually displays traffic, should the CDTI Traffic Display Capability flag be set to ONE or to ZERO?	<p>Need to clarify whether the CDTI capability flag is intended to be static (always the same value) or dynamic (changing whenever the pilot manipulates certain controls).</p> <p>WG6 Response: Clarification will be worded to state that setting of this bit means that a CDTI display is installed AND operating in a mode capable of displaying ADS-B traffic.</p> <p style="text-align: right;">Accepted. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
40	James Maynard, UPS AT	3.4.4.9.6	116	When referring to a list of numbered MASPS requirements, one could be misled into thinking that the TC report requirements apply to all ADS-B equipment. But if the TC report capability level is ZERO, meaning no TC report capability, clearly those requirements do not apply.	<p>Explicitly state, as a numbered requirement, that any requirements on TC reports do not apply if the TC Report Capability Level is ZERO.</p> <p>Add a requirement that transmitting ADS-B equipment that conforms to this version of the MASPS shall set the TC Report Capability Level to ZERO.</p> <p>WG6 Response:</p> <p style="text-align: right;">Referred to plenary.</p>
41	Tom Mosher, UPS AT	3.4.4.10.1	117	<p>(Also see WG5 comment #3 and Jerry Anderson comment #7.)</p> <p>No provision is made for the “unknown” state of the TCAS/ACAS Resolution Advisory Flag. (E.g., if the transmitting participant’s TCAS is not connected to its transmitting ADS-B subsystem.)</p> <p>Stu’s thought: I know we’ve been over this 100 times, but don’t we want the “unknown” case to have the bit set to ONE so that an ACM system assumes an RA when maneuvering against it??</p>	<p>Define the TCAS/ACAS Resolution Advisory Active Flag to be set to ONE by the transmitting participant only if the TCAS RA condition is known to exist. The flag should be ZERO if an RA is not active or the RA status is unknown.</p> <p>WG6 Response:</p> <p style="text-align: right;">Accepted. / Done</p>
42	Steve Horvath, UPS AT	3.4.4.10.3	117	The <i>Note</i> should state that the means by which the “Requesting ATC services” flag is set is outside the scope of this document (rather than in a lower-level document such as a MOPS).	<p>Let’s do it that way.</p> <p>WG6 Response: Editorial.</p> <p style="text-align: right;">Accepted. /Done.</p>
43	James Maynard, UPS AT	3.4.4.16	118	We should make it clear that the True-vs-Magnetic flag in the MS report applies not only to the “Heading while on the surface” field in the SV report, but also to the “heading while airborne” field in the ARV report and the “target heading or track angle” field in the TS report.	<p>Add a note to this effect in §3.4.4.16, where this field of the MS report is discussed.</p> <p>Add similar notes referencing §3.4.4.16 in the descriptions of “heading while on the surface” field in the SV report (§3.4.3.12), the “heading while airborne field” in the ARV report (§3.4.7.6), and the “target heading or track angle” field in the TS report (§3.4.8.5).</p> <p>WG6 Response: Editorial.</p> <p style="text-align: right;">Accepted. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
44	James Maynard, UPS AT	3.4.6	119	<p>The Status Change (SC) “report” is not a <i>report</i> at all, but a <i>message</i>. It is intended to influence the report assembly function in a receiving ADS-B subsystem.</p> <p>The <i>inputs</i> to that function are ADS-B <i>messages</i>, whereas the <i>outputs</i> are ADS-B <i>reports</i> to the receiving ADS-B participant’s client applications.</p> <p>There is no need to introduce a new <i>report</i> type to cause ADS-B reports to be updated with more current information. Rather, it is for the data link MOPS to define whatever <i>messages</i> are required to support a particular ADS-B report type on that MOPS’ particular data link. Whenever any message that provides information for a given report is received, the corresponding report must be updated.</p>	<p>Delete §3.4.6 and its subparagraphs. Reword the descriptions of MS and TC reports accordingly, to mention “messages containing the changed MS information” or “messages containing the changed TC information” instead of “SC reports.”</p> <p>WG6 Response: (See Jerry Anderson comment #30.) Accepted. / Done.</p>
45	James Maynard, UPS AT	3.4.9.5	132	The term “TC Report Cycle Number” has turned out to be confusing. (More than one person has confounded “TC Report Cycle Number” with “TC Report Sequence Number.”)	<p>Change the term “TC Report Cycle Number” to “Flight Plan Version Number” throughout the document.</p> <p>WG6 Response: Editorial. “Flight Plan Version Number” is rejected. However, WG6 will strive for a better, less confusing term. Accepted with modification.</p>
46	Tom Mosher, UPS AT	3.3.3.2.2	96	The NACV values seem to be wrong, as if there had been a blind replacing of “NUC _p ” with “NAC _p ”.	<p>Change “NAC_p ≥ 9” with “NAC_p ≥ 10.”</p> <p>WG6 Response: Editorial. Accepted. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1	Manning L-3 Com Analytics Corp AF/XORM (GANS)	General	All	Draft 1 of RTCA/DO-242 was printed without change bars or other indicators to indicate text that had been changed from the original DO-242 document. This shortcoming made comparing proposed changes in the new document extremely difficult.	Recommend the ADS-B MASPS Working Group identify text in the proposed DO-242A draft that has been modified from the original DO-242 document. This should be standard practice for any future modifications to documents. WG6 Response: As stated in emails, due to the amount of changes in this revision and the volume of text that was moved to new locations in the document it was impractical to distribute a red-lined document for review. WG6 produced a summary paper of those changes. Further, WG6 implemented an issue tracking system. By examining the set of Issue papers addressed in this draft of the MASPS, the reader was able to understand exactly what requirements and other material were changed, why the changes were done, and what part of the document was affected. No action required.
2	Manning L-3 Com Analytics Corp AF/XORM (GANS)	2.1.2.2.2	27	Non-concur comment: Section 2.1.2.2.2 Para 3 and Note 1 allow operation in an anonymous mode. Establishment of this capability on a broad scale seems contrary to basic premise for a broadcast surveillance system within all airspace. Concern for one segment of users does not dictate changes for all. Allowing the decision to elect anonymity to rest solely with the pilot raises security concerns in a post 11 Sep environment.	Change para 3 to read “The ADS-B class A0 units may accommodate a means for the pilot to select anonymity whenever the pilot elects to operate under flight rules permitting an anonymous mode. A capability to disable this feature through a maintenance action shall be provided.” Add Note 3 to read: “Only low-end users are expected to find this a desirable feature. This feature is inessential to the intended use of ADS-B and it is possible that future rule making may disallow this feature.” Recommend the Transportation Security Agency review this proposed capability for its relationship and/or impact to planned airspace security changes. WG6 Response: WG6 agreed to reject the first part of the suggested resolution requesting only A0 equipment be allowed to operate anonymously. It could not be agreed if there should be a means to disable anonymous operations or have a default of non-anonymous mode, or if this should be considered out of scope of the MASPS as regulatory issue. Referred to plenary.

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#	Author	Section	Page	Comment	Suggested Resolution
3	Manning L-3 Com Analytics Corp AF/XORM (GANS)	Multiple	Multiple	<p>(Also see Ron Jones' comments 9 & 30, WG3 comment #1, UPS-AT comments #16, and Lincoln Laboratory #1-h.)</p> <p>Non-concur comment: INTENT UPDATE INTERVAL, DATA CONTENT, ACQUISITION RANGE REDUCTIONS AND INCREASED NUMBER OF TRAJECTORY CHANGE REPORTS.</p> <p>There is no basis for these changes. Update Rate and Acquisition Range reductions and increased TC Reports are not validated requirements of ADS-B and have not been concluded with peer-reviewed results to support the proposed revisions. Instead of being link independent, these "requirements" would impose a significant constraint on some link candidates over others.</p>	<p>Recommend previous intent requirements from original DO-242 document be retained. Language identifying these items as possible future requirements could be included with expanded information provided in appendices.</p> <p style="text-align: right;">WG-6 response: Referred to plenary.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1	MIT/LL	see below	see below	<p><i>Non-concur comment:</i></p> <p>The requirement for Intent reporting represents a major increase in the information transfer requirements for ADS-B, for applications that are not yet well-defined nor validated. As stated in the cover letter that distributed the DO-242A MASPS for review, the new Intent requirements are not to be incorporated in the ADS-B MOPS under development.</p> <p>Part of the Intent requirements lead to long-range air-air reception in the highest density airspace. It is likely that deconfliction applications in high-density airspace will involve ground ATC elements. This will require the use of air-ground data link, either broadcast or addressed, rather than only air-air broadcast.</p> <p>Following are the specific parts of the proposed MASPS changes that we have identified as being a serious problem in this respect. An attachment gives additional explanation.</p>	<p>This material should be placed in an appendix.</p> <p>WG-6 response: Referred to plenary.</p>
1-a	MIT/LL	3.3.3.1.4	90-91	<p>(Also see Ron Jones comment #21.)</p> <p><u>Increase update rate.</u> The proposed change would be a major increase in update rate for Intent information. For example, at 30 nmi range, the existing requirement is for a minimum of 95% communication reliability within 24 seconds of a change of Intent. The proposal would increase this minimum requirement by a factor of 2 (to 12 seconds).</p>	<p>This material should be placed in an appendix.</p> <p>WG-6 response: Referred to plenary.</p>
1-b	MIT/LL	2.1.2.19.2	44	<p><u>Increase number of Intent reports.</u> The proposed change would be a major increase in the number of Intent reports. The existing minimum requirement is for two Intent reports, but the change required in this section would increase the minimum from two to three or more.</p>	<p>Replace the final paragraph in 2.1.2.19.2 with the following. “For equipage classes A2 and A3, the ADS-B system shall (R2.35) provide the capability to transmit and receive messages in support of one TC report.”</p> <p>WG-6 response: Referred to plenary.</p>
1-c	MIT/LL	3.4.9	129	<p><u>Increase information content for an Intent report.</u> Relative to the existing minimum requirements, this proposal would greatly increase the information content of each Intent report, and therefore would require an increase in message transmission rate.</p>	<p>This material should be placed in an appendix.</p> <p>WG-6 response: Referred to plenary.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1-d	MIT/LL	3.3.3.1.2	89	<p>(Also see WG6 #4, Jerry Anderson #20, Ron Jones #20, Tony Warren #9, and UPS-AT #29.)</p> <p><u>Increase in reqd. acquisition probability.</u> The existing minimum requirement for target acquisition including MS information at maximum range is 95%, but the proposed change would add a new minimum requirement for 99% reliability at the same range. This would be a major increase.</p>	<p>This provision should be placed in an appendix. Alternatively, change the 99% range to 70 percent of the original range requirement. That modification would be consistent with the actual behavior of air-to-air links, and would still provide assurance of highly reliable performance to support safety applications.</p> <p>WG-6 response: See consolidated response to WG6 comment #4.</p> <p style="text-align: right;">Referred to plenary.</p>
1-e	MIT/LL	Table 3-4 (a)	87	<p><u>Increase air-air range aft.</u> The existing minimum requirements for long-range air-to-air reception is as follows. Req'd. range = 90 nmi forward, 45 nmi to the sides and 30 nmi aft. The proposed change would increase these ranges and is not sufficiently supported.</p>	<p>Retain the existing standards for aft and port/starboard coverage.</p> <p>WG-6 Response: (See response to UPS AT comment #27.)</p> <p style="text-align: right;">Accepted with modification. / Done.</p>
1-f	MIT/LL	3.3.3.1.1	88	<p><u>Increase aircraft density for 90 nmi air-air range.</u> The basis for the existing ADS-B requirements for air-to-air ranges extending to 90 nmi is to support an application called "Flight Path Deconfliction Planning, Cooperative Separation in Oceanic / Low Density En Route Airspace", which is described in 2.2.2.6. In the proposed changes, this point is made in Note 11 of Table 3-4 (a). But a new sentence is also proposed for this Note that states that there is an exception to 2.2.2.6, and that the density requirement for 90 nmi is actually higher than what is stated in 2.2.2.6.</p>	<p>We understand that this problem may have occurred inadvertently, and may be readily corrected by rewording the second sentence. We propose the following substitution for the second sentence.</p> <p>"It is noted in Section 2.2.2.6, in connection with Table 2-3, that the operational concept and constraints associated with using ADS-B for separation assurance and sequencing have not been fully validated. It is possible that longer ranges may be necessary. Also, the minimum range required may apply even in high interference environments, such as over-flight of high traffic density terminal areas."</p> <p>WG6 Response: Agreed.</p> <p style="text-align: right;">Accepted. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1-g	MIT/LL	Table 3-4 (c)	92	(Also see WG3 #3, Ron Jones comment #21, and Jerry Anderson comment #24.) <u>Repeating information.</u> A new requirement is proposed to repeatedly communicate identical information. This new requirement appears in the last two rows of Table 3-4(c).	Do not accept this new requirement. Alternatively, place this new material in an appendix. WG6 Response: <p style="text-align: right;">Referred to plenary.</p>
1-h	MIT/LL	1.1	2	(Also see WG3 comment #1, Ron Jones comments 9 and 30, and Robert Manning comment #3.). This is an appropriate place to provide clarification that the changes in 242A do not impose major increases in minimum requirements.	Add a paragraph after Figure1-1: “ Increases in minimum ADS-B requirements specified in DO-242A, above the standards in DO-242, apply to future applications of ADS-B still under consideration. These increases should not be considered to be requirements at this time.” WG6 Response: <p style="text-align: right;">Referred to plenary.</p>
1-i	MIT/LL	3.3.3.1.1	82	<u>Increase in req'd. acquisition probability.</u> Another change of this kind is in Section 3.3.3.1.1. The proposed change would be a new minimum that would increase the existing minimum requirement of 95% to a minimum of 99%. The specific wording proposed gives this as informative rather than a new requirement, and if that interpretation is correct, then we do not have an objection to this change.	This provision should be placed in an appendix. Alternatively, we offer a modified change that would apply a 99% reliability standard at a range reduced to 70% of the original range requirement. WG6 Response: (See Ron Jones comment #13.) <p style="text-align: right;">Accepted. / Done.</p>

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#	Author	Section	Page	Comment	Suggested Resolution
1-3	Vincent Nguyen				WG-6 Response: Defer for consideration in ASA MASPS or in Rev B of the DO-242 ADS-B MASPS.) Rejected.
4	Vincent Nguyen			FAA and other governmental agencies desire validation of the MASPS requirements based on intended applications.	Propose adding the following text after the first sentence of §3.3: “The system requirements identified here may require further validation by appropriate governmental agencies based on the intended operational application.” WG-6 Response: Insert sentence in first paragraph of 2.1 that reads as follows “The system requirements in this MASPS will generally require further validation in the context of specific ADS-B applications.” Accepted with Modification. / Done.

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#	Author	Section	Page	Comment	Suggested Resolution
1	C. Haissig	2	31	Section 2.1.2.6 correction states that it is a requirement for the pilot to be able to indicate that the source of pressure altitude information is invalid. Why was this requirement added?	WG6 Response. No action Required.
2	C. Haissig	2	37	Don't understand the "without alerting" phrase in the Surveillance Integrity Level definition (§ 2.1.2.15). Is this meant to mean without the system detecting that it is has exceeded the containment radius?	Definition should be rewritten. WG6 Response. Accepted.
3	C. Haissig	2	38	Barometric altitude integrity code (§ 2.1.2.17). This is just a check against one other source. What defines the cross-check? What's the advantage?	WG6 Response. No action Required.
4	C. Haissig	3	89	Section 3.3.3.1.2 states that mode status (MS) update periods are not specified directly. However, if this is the case, the title of Table 3-4(a) is misleading since it states that it is SV and MS accuracy, updates interval and acquisition range requirements.	Table3-4(a) should be divided to cover MS reports in a separate table as is done with ARV reports. WG6 Response. Accepted. / Done.
5	C. Haissig	3	83-86	Arrows in tables 3-3 and 3-4 are inconsistent and don't add clarity.	WG6 Response. Rejected.
6	C. Haissig	3	86	Table 3-4(a): Why aren't the Required SV Acquisition Range values specified for a 95th and 99th percentile as the MS values are?	WG6 Response. No action Required.
7	C. Haissig	3	86	Table 3-4(a), last row. Are the max error values supposed to be an example, as the previous rows values are?	WG6 Response. No action Required.
8	C. Haissig	3	86	Note 10 for Table 3-4(a) is not relevant since MS accuracy and update interval are not specified.	Delete note. WG6 Response: Accepted. / Done.

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#	Author	Section	Page	Comment	Suggested Resolution
9	C. Haissig	3	86	No value in R<= 10 NM column for ARV acquisition range in Table 3-4(b)	Add value. WG6 Response: See comment UPS-AT #30. Accepted with Modifications. / Done.
10	C. Haissig	3	117	Where does the 18 sec requirement come from for the IDENT switch active (Section 3.4.4.10.2)?	WG6 Response: See comment Chris Moody #4.
11	C. Haissig	3	115	Why are capability codes required? For example, capability to broadcast air-referenced velocity, TS reports, and TC reports? If having this capability is optional, then systems need to be able to handle the omission of this information, so why require the capability codes?	WG6 Response. No action Required.
12	C. Haissig	3	-	Mode status report confusion. Does all Mode Status report information have to be provided for all A and B equipage classes? If not, where is this explained. If so, why is TCAS RA status, for example, required for all A and B equipage classes? Or whether TCAS is operational? Or whether the aircraft has a CDTI?	WG6 Response. No action Required.
13	C. Haissig	3	124	Section 3.4.8.1. A2 equipped aircraft with flight directors or autopilots are required to transmit TS reports. This requires a link to the autopilot/flight director to know whether the autopilot is engaged and what the target altitude, target heading or target track angle are. Is this really a minimum requirement? Is this really required for in-trail climb to altitude, for instance, per Table 3-3(a)	WG6 Response. No action Required.

3.2.3.1 Interactive Aircraft/Vehicle ADS-B Subsystems (Class A)

Functional capabilities of interactive aircraft/vehicle subsystems are indicated in the context diagram of Figure 3-4. These subsystems accept own-platform source data, exchange appropriate ADS-B messages with other interactive ADS-B System participants, and assemble ADS-B reports supporting own-platform applications. Such interactive aircraft subsystems, termed Class A subsystems, are further defined by equipage classification according to the provided user capability. The following types of Class A subsystems are defined in (Table 3-1):

- **Class A0:** Supports minimum interactive capability for participants. Broadcast ADS-B messages are based upon own-platform source data. ADS-B messages received from other aircraft support generation of ADS-B reports ~~which that~~ are used by on-board applications (e.g., CDTI for aiding visual acquisition of other-aircraft tracks by the own-aircraft's air crew). This equipage class may also support interactive ground vehicle needs on the airport surface.
- **Class A1:** Supports all class A0 functionality and additionally supports ~~e.g.,~~ ADS-B-based conflict avoidance ~~and other applications at ranges < 20 NM~~. Class A1 is intended for operation in IFR designated airspace.
- **Class A2:** Supports all class A1 functionality and additionally provides extended range ~~to 40 NM~~ and information processing to ~~support airborne conflict management and other longer range applications, e.g. oceanic climb to co-altitude~~. Class A2 equipment supports broadcast and receipt of intent information contained in TS and TC+0 reports.
- **Class A3:** Supports all class A2 functionality and ~~has additional range capability out to 90 nmi, supporting, e.g., long range airborne conflict management, additionally supports flight path de-confliction. Class A3 subsystems support longer look-ahead times with longer operational ranges than class A2~~. Class A3 equipment supports broadcast and receipt of multiple TC reports.

Table 3-1 Subsystem Classes and Their Features

Class	Subsystem	Example Applications	Features	Comments
Interactive Aircraft/Vehicle Participant Subsystems (Class A)				
A0	Minimum Interactive Aircraft/Vehicle	Enhanced visual acquisition, traffic alerting	Lower Tx power and less sensitive Rx than Class A1 permitted.	Minimum interactive capability with CDTI.
A1	Basic Interactive Aircraft	A0 plus Conflict Avoidance, station keeping	Standard Tx and Rx	Provides ADS-B based conflict avoidance and interface to current TCAS surveillance algorithms/ display
A2	Enhanced Interactive Aircraft	A1 plus Merging, Airborne Conflict management, in-trail climb	Standard Tx power and more sensitive Rx. Interface with avionics source required for TCP data.	Baseline for separation management employing intent information.
A3	Extended Interactive Aircraft	A2 plus long range conflict management	Higher Tx power and more sensitive Rx. Interface with avionics source required for TCP and TCP+1 data	Extends planning horizon for strategic separation employing intent information.
Broadcast-Only Participant Subsystems (Class B)				
B1	Aircraft Broadcast only	Supports A1 applications for other participants	Tx pwr may be matched to coverage needs. NAV input required.	Enables aircraft to be seen by Class A and Class C users.
B2	Ground vehicle Broadcast only	Supports airport surface situational awareness	Tx pwr matched to surface coverage needs. High accuracy NAV input required.	Enables vehicle to be seen by Class A and Class C users.
B3	Fixed obstruction	Supports visual acquisition and airborne conflict management	Fixed coordinates. No NAV input required. Collocation with obstruction not required with appropriate broadcast coverage.	Enables NAV hazard to be detected by Class A users
Ground Receive Subsystems (Class C)				
C1	ATS En route and Terminal Area Operations	Supports ATS cooperative surveillance	Requires ATS certification and interface to ATS sensor fusion system.	En route coverage out to 200 nmi. Terminal coverage out to 60 nmi.
C2	ATS Parallel Runway and Surface Operation	Supports ATS cooperative surveillance	Requires ATS certification and interface to ATS sensor fusion system.	Approach coverage out to 10 nmi. Surface coverage out to 5 nmi.
C3	Flight Following Surveillance	Supports private user operations planning and flight following	Does not require ATS interface. Certification requirements determined by user application.	Coverage determined by application.

M.3**On Condition Report for Advanced Approach Spacing Operations**

The advanced approach spacing operation on condition report contains information regarding planned speeds and ranges from the threshold for final approach. The update rate for this report is TBD.

The final approach speed is entered manually by the flight crew. All other entries are derived by the approach spacing algorithm.

Table M-3: Advanced Approach Spacing On-Condition Report Definition

Element	Contents
1	Participant Address (Section 2.1.2.1.2)
2	Planned final approach air-speed (knots)
3	Planned final approach deceleration range (from threshold) (ft)
4	Number of additional planned speed changes
5	Planned deceleration range 1 (last deceleration before deceleration to final approach speed)
6	Planned air speed after deceleration range 1
7	Planned deceleration range 2
8	Planned air speed after deceleration range 2
.	.
.	.
.	.
	Planned deceleration range N
	Planned air speed after deceleration range N

2.1.2.6 Altitude

Both barometric pressure altitude and geometric altitude (height above the WGS-84 ellipsoid) **shall** (R2.18) be reported, if available, to the transmitting ADS-B subsystem. Some applications may have to compensate if only one source is available. However, when an A/V is operating on the airport surface, the altitude is not required to be reported, provided that the A/V indicates that it is on the surface.

Altitude **shall** (R2.19) be provided with a range from -1,000 ft up to +100,000 ft. For fixed or movable obstacles, the altitude of the highest point should be reported.

Note: In this context, a “movable obstacle” means an obstacle that can change its position, but only slowly, so that its horizontal velocity may be ignored.

ADS-B link equipment **shall** (R2.xx) support a means for the pilot to indicate that the broadcast of altitude information from pressure altitude sources is invalid. This capability can be used at the request of ATC or when altitude is determined to be invalid by the pilot.

Attachment WG5-1: Label "274" as Currently Specified for TCAS -to- Transponder

LABEL 274, TCAS -to- TRANSPONDER—RTCA/DO-185A COMPATIBLE

LABEL: 274
NAME: TXWORD 2, Standard ARINC-429 Format for Bus 2, Word 2
 TCAS -to- Transponder and to Displays
 TCAS OUTPUT (SL, RI)
 (See Note 1)
UPDATE RATE: 5/SECOND (MINIMUM)
 10/SECOND (MAXIMUM)
SOURCE: TCAS, ARINC 735A
DATA TYPE: Discrete
REFERENCE: ARINC 735A, Attachment 19A-1, 19B-2, 19D-1, and Attachment 12

LABEL – 274 TXWORD 2, TCAS -to- TRANSPONDER			
Bit #	Function	Coding	RF Message Bit
1	Label 1 st Digit	“2”	1
2	Label 1 st Digit		0
3	Label 2 nd Digit	“7”	1
4	Label 2 nd Digit		1
5	Label 2 nd Digit		1
6	Label 3 rd Digit	“4”	1
7	Label 3 rd Digit		0
8	Label 3 rd Digit		0
9	PAD		
10	PAD		
11	Version Indicator (VI) (LSB)		(See Note 3)
12	Version Indicator (VI) (MSB)		
13	PAD		
14	PAD		
15	PAD		
16	PAD		
17	PAD		
18	PAD		
19	PAD		
20	PAD		
21	PAD		
22	PAD		
23	SL (MSB)	(See Notes 2, 4, and 5)	9
24	SL		10
25	SL (LSB)		11
26	RI (MSB)	(See Notes 2, 4, and 6)	14
27	RI		15
28	RI		16
29	RI (LSB)		17
30	SSM	(See Note 7)	
31	SSM		
32	PARITY	ODD	

Notes:

1. ARINC 429 data word fields for which there are corresponding RF fields are transmitted with the MSB first in order to maintain consistency between RF and ARINC 429 data. Normal ARINC 429 protocol calls for the transmission of the LSB of the field first.
2. The FAA TSO-C119A compatible interface defined the “274” TXWORD2 for output to both the Transponder and Displays. The RTCA/DO-185A compatible interface defines the “274” TXWORD2 for output only to the Transponder. Existing Displays may or may not be capable of properly processing the new TXWORD2; therefore, unless it can be guaranteed that the new TXWORD2 does not impact operation of the Displays, the TXWORD2 sent to the Display by an RTCA/DO-185A compatible TCAS shall remain the same as previously defined in Attachment 6U of ARINC-735A, i.e., section 3.274.3.
3. The Version Indicator Field provides the method for the TCAS to advise the Transponder whether or not is compatible with RTCA/DO-185A, and is encoded as follows:

Attachment WG5-1: Label "274" as Currently Specified for TCAS –to- Transponder

TXWORD 2 - VERSION INDICATOR (VI) ENCODING		
Bit 12	Bit 11	Encoding
0	0	FAA TSO-C119A Compatible
0	1	RTCA/DO-185A Compatible
1	0	Not Defined
1	1	Not Defined

If VI = 0, the Transponder shall continue to communicate with the TCAS as provided in Attachments 6A through 6D, Attachments 6K through 6V, and Attachment 12 of ARINC-735A which detail the FAA TSO-C119A compatible bus operation.

If VI = 1, the Transponder shall communicate with the TCAS as provided in Attachment 19 of ARINC-735A, which modifies operation specified in Attachments 6A through 6D, Attachments 6K through 6V, and Attachment 12 of ARINC-735A to be consistent with the RTCA/DO-185A capability.

If the Transponder receives a VI indicating a capability that exceeds that of the Transponder design, then the Transponder shall operate at the highest capability possible.

4. These bits are sent by own Transponder in data word DF=16.
5. The SL bits should be used by the TA and TA/RA displays to determine the TCAS Computer mode. The SL field should be used by the displays to determine if the TCAS Computer is in STBY mode. When the TCAS Computer is not in STBY mode, the RI field should be used to determine the TCAS Computer mode. The following bit definitions apply:

SL Field			
Bit 25	Bit 24	Bit 23	MODE
1	0	0	STBY
All other bit combinations are undefined			

The TCAS Computer is in STBY mode when the SL field indicates "STBY". If the SL field does not indicate "STBY", then the RI field can be used to determine the TCAS Computer mode.

6. RI Field:

RI Field				
Bit 29	Bit 28	Bit 27	Bit 26	MODE
0	0	0	0	No on-board TCAS
1	0	0	0	NOT ASSIGNED
0	1	0	0	TA ONLY
1	1	0	0	TA/RA
0	0	1	0	Reserved for TCAS IV
1	0	1	0	NOT ASSIGNED
0	1	1	0	NOT ASSIGNED
1	1	1	0	NOT ASSIGNED
0	0	0	1	Not Provided by TCAS
- through -				
0	1	1	1	
1	1	1	1	

7. TXWORD 2, "SSM" Encoding

TXWORD 2 - SSM ENCODING		
Bit 31	Bit 30	Encoding
0	0	VALID
0	1	NO COMPUTED DATA
1	0	FUNCTIONAL TEST
1	1	FAILURE WARNING

Attachment WG5-2: Proposed New Label "274" for Transponder Maintenance Bus Output

LABEL 274, TRANSPONDER MAINTENANCE BUS OUTPUT

LABEL: 274
NAME: TXWORD 2,
 Transponder Maintenance Bus Output
 TCAS OUTPUT (VI, SL, RI)
 (See Note 1)
UPDATE RATE: 1/SECOND (MINIMUM)
 5/SECOND (MAXIMUM)
SOURCE: TCAS, ARINC 718A (To Be Updated)
DATA TYPE: Discrete
REFERENCE: Current Reference: ARINC 735A, Attachment 19A-1, 19B-2, 19D-1, and Attachment 12

LABEL – 274			
TXWORD 2, TCAS -to- TRANSPONDER			
Bit #	Function	Coding	RF Message Bit
1	Label 1 st Digit	“2”	1
2	Label 1 st Digit		0
3	Label 2 nd Digit	“7”	1
4	Label 2 nd Digit		1
5	Label 2 nd Digit		1
6	Label 3 rd Digit	“4”	1
7	Label 3 rd Digit		0
8	Label 3 rd Digit		0
9	PAD		
10	PAD		
11	Version Indicator (VI) (LSB)		(See Note 3)
12	Version Indicator (VI) (MSB)		
13	PAD		
14	PAD		
15	PAD		
16	PAD		
17	PAD		
18	PAD		
19	PAD		
20	PAD		
21	RA Indicator	(See Note 8)	
22	IDENT Indicator	(See Note 9)	
23	SL (MSB)	(See Notes 2, 4, and 5)	9
24	SL		10
25	SL (LSB)		11
26	RI (MSB)	(See Notes 2, 4, and 6)	14
27	RI		15
28	RI		16
29	RI (LSB)		17
30	SSM	(See Note 7)	
31	SSM		
32	PARITY	ODD	

Notes:

1. ARINC 429 data word fields for which there are corresponding RF fields are transmitted with the MSB first in order to maintain consistency between RF and ARINC 429 data. Normal ARINC 429 protocol calls for the transmission of the LSB of the field first.
2. The FAA TSO-C119A compatible interface defined the “274” TXWORD2 for output to both the Transponder and Displays. The RTCA/DO-185A compatible interface defines the “274” TXWORD2 for output only to the Transponder. Existing Displays may or may not be capable of properly processing the new TXWORD2; therefore, unless it can be guaranteed that the new TXWORD2 does not impact operation of the Displays, the TXWORD2 sent to the Display by an RTCA/DO-185A compatible TCAS shall remain the same as previously defined in Attachment 6U of ARINC-735A, i.e., section 3.274.3.

Attachment WG5-2: Proposed New Label "274" for Transponder Maintenance Bus Output

3. The Version Indicator Field provides the method for the TCAS to advise the Transponder whether or not is compatible with RTCA/DO-185A, and is encoded as follows:

TXWORD 2 - VERSION INDICATOR (VI) ENCODING		
Bit 12	Bit 11	Encoding
0	0	FAA TSO-C119A Compatible
0	1	RTCA/DO-185A Compatible
1	0	Not Defined
1	1	Not Defined

If VI = 0, the Transponder shall continue to communicate with the TCAS as provided in Attachments 6A through 6D, Attachments 6K through 6V, and Attachment 12 of ARINC-735A which detail the FAA TSO-C119A compatible bus operation.

If VI = 1, the Transponder shall communicate with the TCAS as provided in Attachment 19 of ARINC-735A, which modifies operation specified in Attachments 6A through 6D, Attachments 6K through 6V, and Attachment 12 of ARINC-735A to be consistent with the RTCA/DO-185A capability.

If the Transponder receives a VI indicating a capability that exceeds that of the Transponder design, then the Transponder shall operate at the highest capability possible.

4. These bits are sent by own Transponder in data word DF=16.
5. The SL bits should be used by the TA and TA/RA displays to determine the TCAS Computer mode. The SL field should be used by the displays to determine if the TCAS Computer is in STBY mode. When the TCAS Computer is not in STBY mode, the RI field should be used to determine the TCAS Computer mode. The following bit definitions apply:

SL Field			
Bit 25	Bit 24	Bit 23	MODE
1	0	0	STBY
All other bit combinations are undefined			

The TCAS Computer is in STBY mode when the SL field indicates "STBY". If the SL field does not indicate "STBY", then the RI field can be used to determine the TCAS Computer mode.

6. RI Field:

RI Field				
Bit 29	Bit 28	Bit 27	Bit 26	MODE
0	0	0	0	No on-board TCAS
1	0	0	0	NOT ASSIGNED
0	1	0	0	TA ONLY
1	1	0	0	TA/RA
0	0	1	0	Reserved for TCAS IV
1	0	1	0	NOT ASSIGNED
0	1	1	0	NOT ASSIGNED
1	1	1	0	NOT ASSIGNED
0	0	0	1	Not Provided by TCAS
- through -				
0	1	1	1	
1	1	1	1	

7. TXWORD 2, "SSM" Encoding

TXWORD 2 - SSM ENCODING		
Bit 31	Bit 30	Encoding
0	0	VALID
0	1	NO COMPUTED DATA
1	0	FUNCTIONAL TEST
1	1	FAILURE WARNING

Attachment WG5-2: Proposed New Label "274" for Transponder Maintenance Bus Output

8. *RA Indicator (bit 21 coding)*

0 = Transponder **IS NOT** currently receiving an active Resolution Advisory from the on-board TCAS Computer.

1 = Transponder **IS** currently receiving an active Resolution Advisory from the on-board TCAS Computer.

9. *IDENT Indicator (bit 22 coding)*

0 = The transponder **IS NOT** currently indicating an IDENT ("SPI") condition in ATCRBS and Mode-S replies.

1 = The transponder **IS** currently indicating an IDENT ("SPI") condition in ATCRBS and Mode-S replies.

Attachment RS-1: Early Definition of BDS-40 from ICAO Manual of Mode-S Specific Services
(Circa 1997)

Table 2-64 BDS 4,0 - Aircraft Intention

BDS 4,0 MB FIELD												
1	STATUS	PURPOSE : To provide ready access to information about an aircraft's short-term intentions, in order to improve the effectiveness of conflict probes and to provide additional tactical information to controllers. <i>Notes:</i> 1) The data entered into this register should be derived from the sources that are controlling the aircraft, however when a valid parameter is available and there is insufficient information to ensure that it is being delivered from the system that is flying the aircraft the Mode field for that parameter shall be set to the value = 00. (See Note 3) 2) Selected track/heading and selected airspeed/mach are switchable with an extra switch bit included to indicate which parameter is in use. It is defined as follows:										
2	MSB = 32 768 ft											
3												
4	SELECTED											
5	ALTITUDE											
6	ARINC 429 Label 102											
7												
8	Range = 0 to 65 520 ft											
9												
10												
11												
12												
13	Resolution = 16 ft											
14	STATUS											
15	SIGN											
16	MSB = 8 192 ft/min											
17	SELECTED											
18	ALTITUDE RATE											
19	ARINC 429 Label 104											
20												
21	Range = ± 16 352 ft/min											
22												
23												
24	Resolution = 32 ft/min											
25	SWITCH	<table><tr><td>SWITCH bit</td><td>0</td><td>1</td></tr><tr><td>Track/heading</td><td>Track</td><td>Heading</td></tr><tr><td>Airspeed/Mach</td><td>Airspeed</td><td>Mach</td></tr></table>		SWITCH bit	0	1	Track/heading	Track	Heading	Airspeed/Mach	Airspeed	Mach
SWITCH bit	0	1										
Track/heading	Track	Heading										
Airspeed/Mach	Airspeed	Mach										
26	STATUS	3) 8 mode bits have been allocated to provide a limited and standardized set of modes derived from the more extensive ARINC 429 FCC status words. This is sufficient to indicate the validity of each parameter to the ground systems which do not need to understand the full complexities of operation of FCCs. The mode is defined with 2 bits per parameter as follows: 00 = Not active 01 = Acquiring 10 = Maintaining (or capture) 11 = Holding actual rather than selected value										
27	SIGN											
28	MSB = 90 degrees											
29												
30	SELECTED MAGNETIC											
31	TRACK/HEADING											
32	ARINC 429 Label 114/101											
33												
34	Range = ± 180 degrees	4) For all parameters the value used is to be the 'target' rather than the 'control' as the latter may fluctuate continuously under the control of the FMS or other system. For example, selected heading is not suitable when flying a track. 5) Bit 48 defines the coding of the MODE bits : 1 = defined as per above scheme (described in note 3) 0 = defined as per above scheme for Selected Alt. only; for other parameters only two states are applicable : 00 = Not active 01 = Active										
35	Resolution = 360/512 degrees											
36	SWITCH											
37	STATUS											
38	MSB = 256 Kt/Mach 2.048 (see Note 2)											
40	SELECTED											
41	AIRSPEED/MACH											
42	ARINC 429 Label 103/106											
43												
44	Range = 0 to 512 Kt/Mach 4.096											
45												
46												
47	Resolution = 0.5 Kt/Mach 0.004											
48	MODE coding flag											
49	MODE											
50	SELECTED ALTITUDE											
51	MODE											
52	SELECTED ALTITUDE RATE											
53	MODE											
54	SELECTED TRACK/HEADING											
55	MODE											
56	SELECTED AIRSPEED/MACH											

Attachment RS-2: Early Definition of BDS-40 from ICAO Manual of Mode-S Specific Services

TABLE 4.0 BDS 4.0 AIRCRAFT INTENTION – MB FIELD (See Note T-3)				
FIELD BIT	FIELD NAME	NOTES	PROBABLE DATA SOURCE	ARINC-429 LABEL
1	STATUS	<p>1) The data entered into bits 1 -to- 13 should be derived from the Altitude Control Panel (Mode Control Panel/ Flight Control Unit or equivalent equipment).</p> <p>Alerting devices may be used to provide data if it is not available from 'control' equipment. <i>The associated mode bits for this field (48 -to- 51) shall be as detailed in Note 3 below.</i></p>	See Note T-1	See Note T-1
2	MSB = 32,768 ft.			
3				
4				
5	MCP / FCU			
6	SELECTED ALTITUDE			
7	(ARINC-429 LABEL 102)			
8				
9				
10	RANGE: 0 -to- 65,520 ft.			
11	RESOLUTION: 16 ft.			
12				
13	LSB Resolution = 16 ft.			
14	STATUS	<p>2) The data entered into bits 14 -to- 26 shall be <i>derived from the Flight Management System or equivalent equipment managing the vertical profile of the aircraft.</i></p> <p>4) Target Altitude shall be the short-term vertical intent value, at which the aircraft will level-off (or has leveled-off) at the completion of the current manoeuvre. <i>The data source that the aircraft is currently using to determine the target altitude shall be indicated in the altitude source bits (54 -to- 56) as detailed in Note 3 below.</i></p> <p><i>Note: This information which represents the real "aircraft intent", when available, represented by the Altitude Control Panel Selected Altitude, The Flight Management System Selected Altitude, or the current Aircraft altitude, according to the aircraft's mode of flight (the intent may not be available At all when the pilot is flying the aircraft manually).</i></p>	See Note T-1	See Note T-1
15	MSB = 32,768 ft.			
16				
17				
18				
19	FMS SELECTED ALTITUDE			
20	(ARINC-429 LABEL 102)			
21				
22				
23	RANGE: 0 -to- 65,520 ft.			
24	RESOLUTION: 16 ft.			
25				
26	LSB Resolution = 16 ft.			
27	STATUS	<p>5) The current Barometric Pressure Setting shall be calculated from the value contained in the field (Bits 28 -to- 39) pluss 800 millibars (mb).</p> <p>When the Barometric Pressure Setting is less than 800 mb or greater than 1209.5 mb, the Status Bit for this field (Bit 27) shall be set to indicate invalid data.</p>	See Note T-2	See Note T-2
28	MSB = 204.8 mb			
29				
30				
31				
32	BAROMETRIC PRESSURE SETTING			
33	MINUS 800 mb			
34	(ARINC-429 LABEL 234)			
35				
36	RANGE: 0 -to- 409.5 mb			
37				
38				
39	LSB Resolution = 0.1 mb			
40				
41				
42				
43				
44	RESERVED			
45	(set to "0" until further defined)			
46				
47				
48	STATUS OF MCP / FCU MODE BITS	<p>3) Bits 48 -to- 56 shall <i>indicate</i> the status of the values provided in bits 1 -to-26 as follows:</p> <p>Bit 48 <i>shall</i> indicate whether the Mode Bits (49, 50, and 51) are actively being populated:</p> <p>0 = No mode information provided 1 = Mode information deliberately provided</p> <p>Bits 49, 50, and 51:</p> <p>0 = Not Active 1 = Active</p> <p>Bit 54 shall indicate whether the Target Altitude Source Bits (55 and 56) are actively being populated:</p> <p>0 = No source information provided 1 = Source information deliberately provided</p> <p>Bits 55 and 56, shall indicate that Target Altitude <i>Source</i> is:</p> <p>00 = Unknown 01 = Aircraft Altitude 10 = FCU / MCP Selected Altitude 11 = FMS Selected Altitude</p>		
49	VERTICAL NAVIGATION (VNAV) MODE			
50	ALTITUDE HOLD MODE			
51	APPROACH MODE			
52	RESERVED			
53	RESERVED			
54	STATUS OF TARGET ALT. SOURCE BITS			
55	MSB TARGET ALTITUDE SOURCE			
56	LSB			

ISSUE:

The ballot draft DO-242A has modified the air-to-air range requirement for the flight path deconfliction application in Note 3 to Table 3-4(a) to:

The 90 NM range requirement applies in the forward direction. The required range aft is 40 NM. The required range 90 degrees to port and starboard is 64 NM. (see Appendix H) [The 120 NM desired range applies in the forward direction. The desired range aft is 48 NM. The desired range 90 degrees to port and starboard is 85 NM.]

The revised Note 3 for Table 3-4(a) incorrectly interprets the range requirement from Appendix H. Rather the 64 NM range requirement applies to targets at +/- 45 degree from forward and not from port or starboard (i.e., +/- 90 degrees from forward) bearing angles. Furthermore, there is no basis presented in Appendix H to justify the increase in aft range to the 48 NM value in the new Note 3 to table 3-4(a).

DISCUSSION:

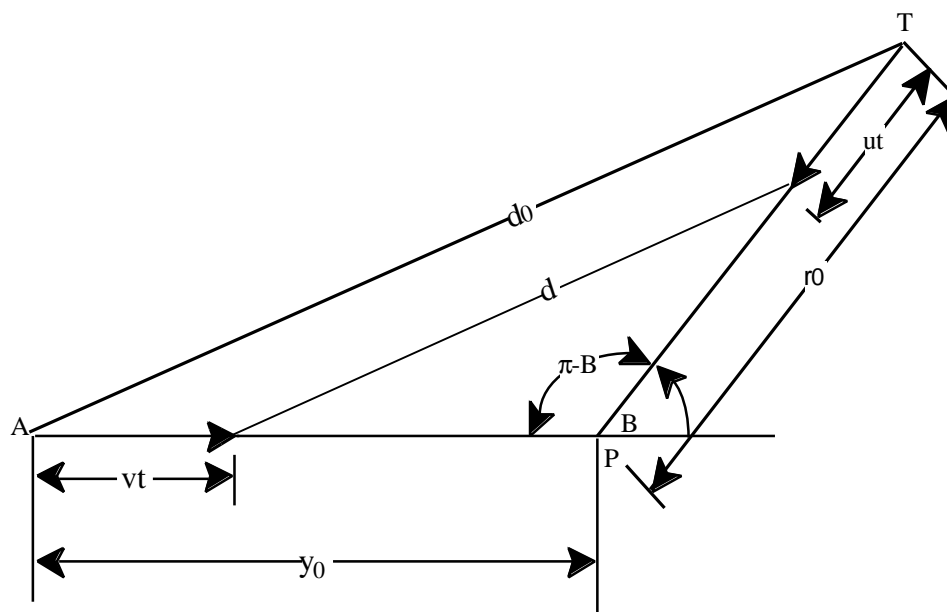
The intent of expressing the range requirements relative to target bearing is to provide a constant 4.5 minute acquisition range for encounters where the target aircraft is approaching from various bearing angles. The maximum aircraft velocity is set at 600 knots (Appendix H) thus the maximum distance either own aircraft or target aircraft can travel in 4.5 minutes is 45 NM. This leads to the 90 NM requirement from Table 3-4a being applicable to a head-on encounter.

The specific text and the associated Figure from Appendix H that relates to Note 3 of Table 3-4a is from DO-242A Section H.2 (Constant Alert Time Analysis) and is provided below:

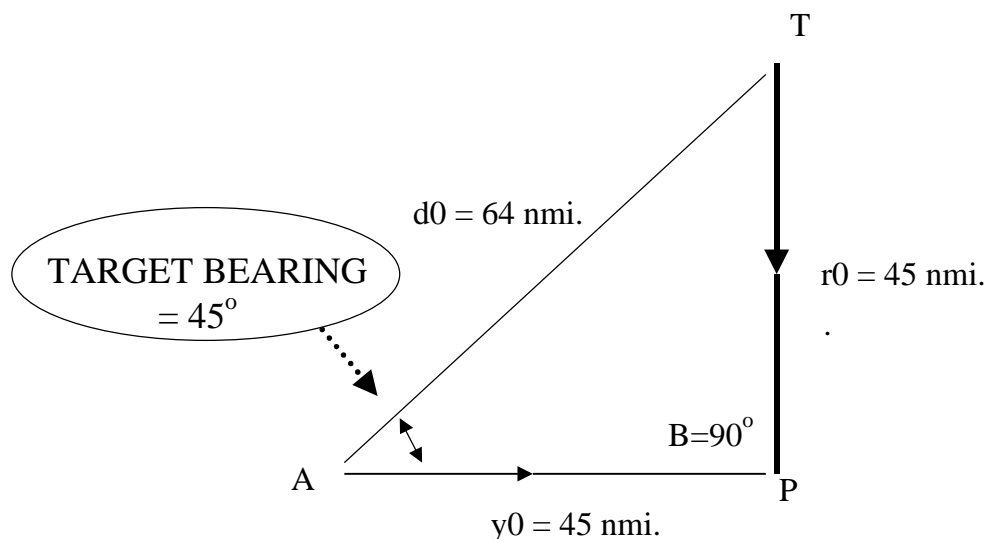
Several criteria may be used to examine air-to-air receive coverage requirements when all aircraft transmit with the same omnidirectional gain, G_0 . Figure H-1 shows own aircraft, A, headed along the y-axis at a speed, v , with a potential threat aircraft, T, moving at a speed, u , on a radial track intercepting the A projected track at y_0 at an angle, B. The separation between aircraft as a function of time is d . Figure H-1 also summarizes the relationships defining d and $\Delta d/\Delta t$, the rate of change of this separation range.

For a Level A3 ADS-B system, the required acquisition range for an encounter geometry with a minimum alert time requirement of 4.5 minutes (Table 2-3) depends on the encounter angle B as shown in Figure H-1. The worst case geometry is a head-on encounter with $B=0^\circ$ and both aircraft traveling at 600 kts, i.e. $u = v = 600$ kts. In this case the closure rate $\Delta d/\Delta t$ is 20 NM/min and the acquisition range in the forward direction is $R = 20 \text{ NM/min} * 4.5 \text{ min} = 90 \text{ NM}$. **For a crossing encounter with $B=90^\circ$ and both aircraft traveling 600 kts we have $d / \dot{d} = y = r$ and the closure rate is $Dd/Dt = 10 * \dot{d} \sim 14.14 \text{ NM/min}$. The acquisition range for this geometry is thus $R = 14.14 \text{ NM/min} * 4.5 \text{ min} \sim 64 \text{ NM}$. In the rear direction $B=180^\circ$, the worst case geometry for an overtake is assumed to be the aircraft behind traveling at 600 kts and the lead aircraft traveling at about 120 kts for an aft encounter with a closure rate $Dd/Dt = 8 \text{ NM/min}$. In this case the acquisition range for an alert time of 4.5 minutes is $R = 8 \text{ NM/min} * 4.5 \text{ min} = 36 \text{ NM}$. However, since a Level A3 system is also an A2 system with a minimum acquisition range of 40 NM in all directions (Table 2-3), the minimum acquisition range aft for an A3 is also 40 NM.**

Attachment WG3-1: Acquisition Ranges for Targets to the Side or Aft of Ownship

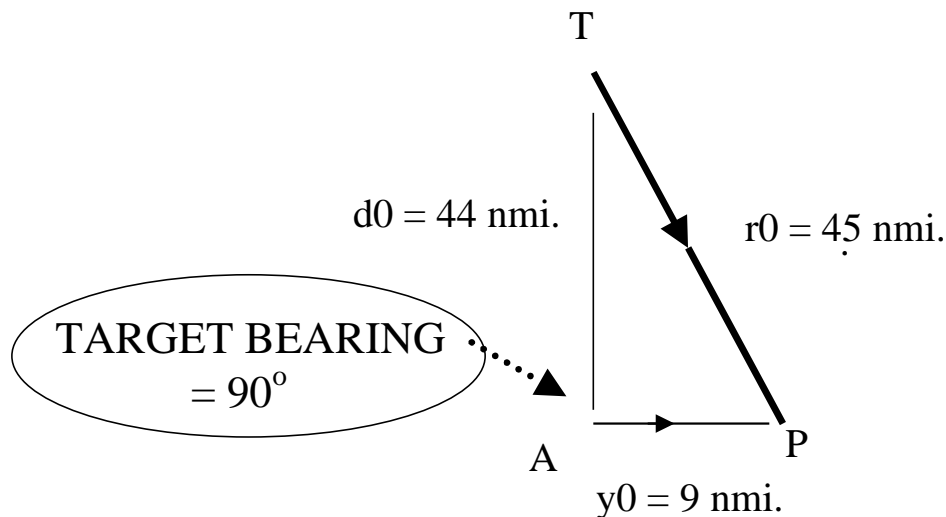


With angle $B=90$ degree for the crossing encounter this figure can be more accurately redrawn as follows:



Thus the 64 NM range requirement is not appropriate for a Port or Starboard target bearing encounter but rather for an encounter where the target aircraft is approaching at a bearing of 45 degrees from the forward direction.

The worst case for a true port or starboard target bearing encounter and where own aircraft is operating at the minimum velocity and where the target aircraft is approaching at the maximum velocity (i.e., 600 knots). The current DO-242 Appendix H analysis used a minimum aircraft velocity of 300 knots in keeping with high altitude enroute/oceanic operations. The revised Appendix H of DO-242A has changed the minimum aircraft velocity to just 120 knots. While this low a velocity may be unrealistic for high altitude operations, even such a low value would result in the following maximum port and starboard air-to-air range requirement.



Thus in this worst case Port or Starboard encounter (requiring maximum air-to-air acquisition range) own aircraft (A) has a velocity of 120 knots and the target aircraft (T) has a velocity of 600 knots, the required range is 44 nmi. in order to provide target tracking for 4.5 minutes before point of closest approach.

Finally for the aft range the current DO-242 Appendix H describes a case where own aircraft is operating at 300 knots and is being overtaken by a target aircraft operating at 600 knots (maximum velocity). This would result in an aft range requirement of 22.5 NM for a 4.5 minute time to point of closest approach. The proposed DO-242A appendix H decreases own aircraft velocity 120 knots and this results in a revised requirement for a 36 NM aft range in order to provide a 4.5 minute time to point of closest approach. There is no justification provided for the Table 3-4a, Note 3 aft range requirement of 48 NM nor is there any justification provided for reducing the minimum aircraft velocity from 300 knots (of DO-242 Appendix H) to the much lower value of 120 knots as included in DO-242A Appendix H.

PROPOSED MASPS CORRECTION

Correct Draft DO-242A to the range values as specified in DO-242 as there is no justification for the proposed changes nor are the proposed changes of Table 3-4a, Note 3 consistent with the analysis of Appendix H (neither the original Appendix H or DO-242 nor the proposed revised Appendix H of DO-242A).

The requirement (R2.17 in §2.1.2.5 of the ballot draft of DO-242A) that an aircraft over a certain size must transmit a position that is different from the position of its GPS antenna is a requirement that need not, and should not, be imposed on all aircraft over a certain size everywhere in the world. It will be only at certain airports that the surface applications that this requirement supports would be used.

Consider, for example, a “powered glider” (a contradiction in terms?) with an overall length of 25 m and wingspan of 50 m. Such an aircraft, as explained in the *Note* in §3.4.4.6, would be assigned an aircraft length code of 3 and a width code of 1. It would therefore, according to requirement R2.17 in §2.1.2.5, be required to transmit the position of its “ADS-B position reference point,” at least if it carried a sufficiently accurate GPS receiver. But the airports where such an aircraft would be likely to operate – airports used by glider clubs – would probably not be the busy metropolitan airports where commercial aircraft over a certain size might be required to be equipped to support applications (such as runway incursion alerting) that would require aircraft to send the positions of their ADS-B reference points. It would be an unreasonable burden to require the operator of this powered glider to carry equipment, including a heading sensor, that would be necessary to transform the position of its GPS antenna to its ADS-B reference position, when the glider doesn’t operate at those busy metropolitan airports.

Consider also the cargo airline fleets, in which 1090 MHz ADS-B equipment is already being installed. In order to comply with DO-242A, would they be required to retrofit the entire fleet with the necessary equipment to support runway incursion alerting applications -- applications that are not yet required at any airport!

I think it would be better not to require that aircraft over a certain size should always transmit the position of their ADS-B reference points. Rather, we should require that only of those aircraft that announce, in a CC code, that it is the ADS-B reference point position that they are transmitting. That way, if equipage with this capability is required to operate at a particular airport, the aircraft would be announcing that it is properly equipped. Any aircraft that do not broadcast that capability code could be denied the use of airports where the capability is required. But aircraft, such as the powered glider of my example, that are not operating where the capability is not required, need not be equipped that way.

Also, an aircraft’s ADS-B position reference point is presently defined as the center of the smallest rectangle that circumscribes the aircraft’s horizontal extent and is oriented parallel to the aircraft’s heading. This may not be the optimum location for use with some applications. See Figure 1 below.

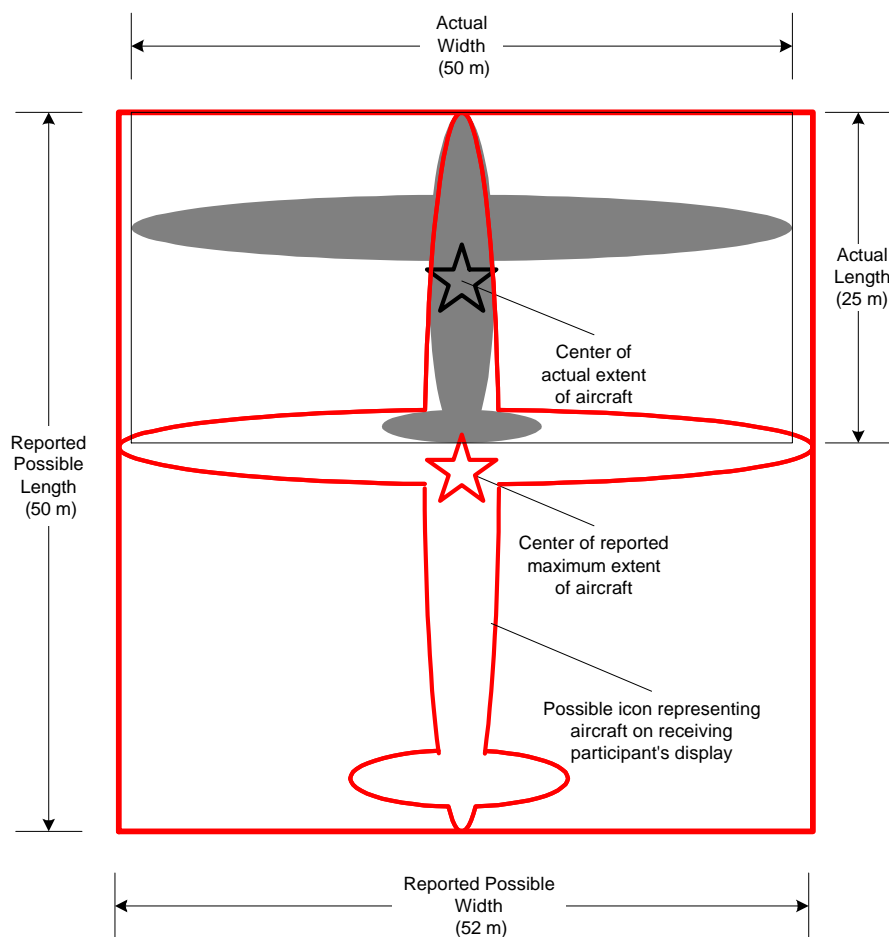


Figure 1. Two Possible ADS-B Position Reference Points.

The figure shows the circumscribing rectangle for the powered glider of our example, and also the rectangle that bounds the maximum extent of that powered glider as reported in its aircraft length and width codes.

The smaller circumscribing rectangle is useful for defining which aircraft length and width codes will be broadcast when the aircraft is on the surface. (Those length and width codes are reported in the MS report). The larger rectangle, however, is what user applications at a receiving ADS-B participant would perceive. Such applications will not know the *actual* length or width of the transmitting aircraft, but rather the *maximum* length and width that an aircraft could have and broadcast the reported length and width codes. It is probably desirable to locate the ADS-B reference point at the center of that larger rectangle, since the extent of the larger rectangle is what is known at the receiving aircraft. And for some user applications, such as runway incursion alerting, it *might* be desirable to position that larger rectangle as shown in the figure, so that the nose of the aircraft touches the front of the larger rectangle. (That way, an aircraft stopped at the hold line while waiting for access to a runway would not seem to have its nose intruding into the runway.)

Rational for UPS AT Comments #3 and #38 on the Ballot Draft of DO-242A

The exact requirement on just where the ADS-B reference point ought to be located must be deferred until we have guidance from operational concept descriptions for user applications that would use this information. However, we should specify *now*, in DO-242A, that when an aircraft announces (in the new CC code) that it is transmitting the position of its ADS-B reference point, that that reference point should be the center of the larger rectangle – which might turn out not to be the same point as the center of the smaller rectangle.

Attachment B below sets out the proposed text changes to accommodate this proposal.

Change §2.1.2.5 to read as follows:

2.1.2.5 ADS-B Position Reference Point

The ADS-B position reference point is the position on an A/V that is broadcast in ADS-B messages as the nominal position of that A/V. For aircraft and ground vehicles that broadcast ONE as the “reporting reference point position” CC code (M report element #7g, §3.4.4.9.7), this position **shall** (R2.17-A) be the center of a rectangle that is aligned parallel to the A/V’s heading and has length and width equal to the longest possible length and width for an aircraft with the same length and width codes as that element transmits (in MS element #5c, §3.4.4.6) while on the surface. The ADS-B position reference point **shall** (R2.17B) be located such that the actual extent of the A/V is contained entirely that rectangle centered on the ADS-B position reference point. (See Figure 2.1.2.5 below.)

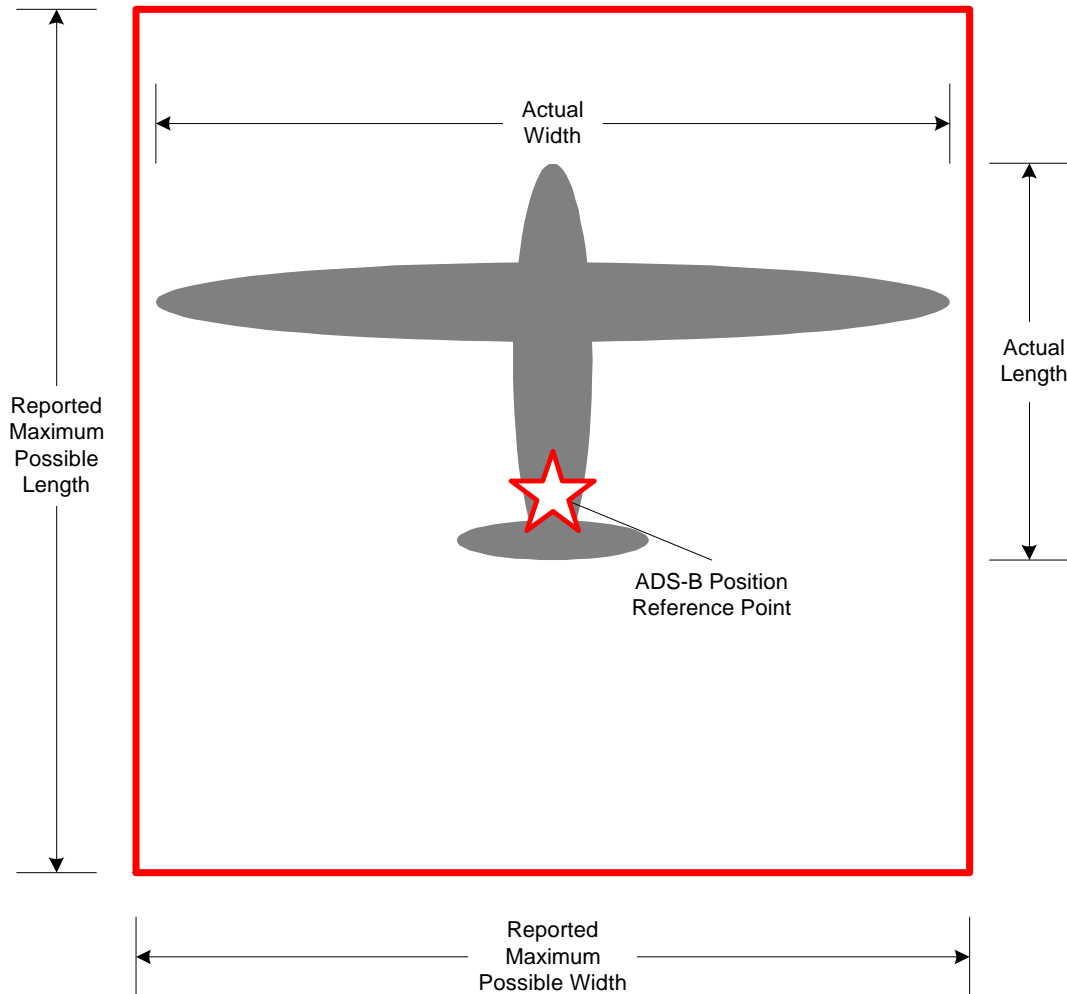


Figure 2.1.2.5: ADS-B Position Reference Point.

Attachment UPS-AT-2

Proposed Text Changes for UPS AT Comments #3 and #38 on the Ballot Draft of DO-242A

Change Table 3.4.4. in §3.4.4 to read as follows:

Elements That Trigger Status Change Report				
	MS Elem. #	Contents [Resolution or # of bits]	Reference Section	Notes
ID	1	Participant Address [24 bits]	2.1.2.2.1	
	2	Address Qualifier [4 bits]	2.1.2.2.2	1
TOA	3	Time of Applicability [1 s resolution]	3.4.4.2	
Version	4	ADS-B Version Number [3 bits]	3.4.4.3	
ID, Continued	5a	Call sign [up to 8 alpha-numeric characters]	3.4.4.4	
	5b	Emitter Category [5 bits]	3.4.4.5	
	5c	A/V Length and Width Codes [4 bits]	3.4.4.6	2
Status	6a	Mode-Status Data Available [1 bit]	3.4.4.7	
	6b	Emergency/Priority Status [3 bits]	3.4.4.8	3
CC, Capability Codes	7	Capability Class Codes [16 bits]	3.4.4.9	
		7a: CDTI display capability [1 bit]	3.4.4.9.1	
		7b: TCAS/ACAS installed and operational [1 bit]	3.4.4.9.2	
		7c: (Reserved for Service Level) [4 bits]	3.4.4.9.3	
		7d: ARV report Capability Flag [1 bit]	3.4.4.9.4	
		7e: TS report Capability Flag [1 bit]	3.4.4.9.5	
		7f: TC report Capability Level [2 bits]	3.4.4.9.6	
		7g: Reporting ADS-B Reference Position [1 bit]	3.4.4.9.7	
OM, Operational Mode	8	(CC Codes reserved for future growth) [5 bits]	3.4.4.9.8	
		Operational Mode Parameters [16 bits]	3.4.4.10	
		8a: TCAS/ACAS resolution advisory active [1 bit]	3.4.4.10.1	4
		8b: IDENT Switch Active [1 bit]	3.4.4.10.2	3
		8c: Receiving ATC services [1 bit]	3.4.4.10.3	
		(Reserved for future growth) [13 bits]	3.4.4.10.4	
SV Quality	9a	Nav. Acc. Category for Position (NAC _p) [4 bits]	3.4.4.11	4
	9b	Nav Acc. Category for Velocity (NAC _v) [3 bits]	3.4.4.12	4
	9c	Surveillance Integrity Level (SIL) [2 bits]	3.4.4.13	4
	9d	(Res. For BAQ, Barometric Altitude Quality) [2 bits]	3.4.4.14	
	9e	NIC _{baro} - Altitude Cross Checking Flag [1 bit]	3.4.4.15	
Data Reference	10a	True/Magnetic Heading [1 bit]	3.4.4.16	
	10b	Vertical Rate Type (Baro. /Geo.) [1 bit]	3.4.4.17	
Other	11	Reserved for Flight Mode Specific Data [3 bits]	3.4.4.18	

Proposed Text Changes for UPS AT Comments #3 and #38 on the Ballot Draft of DO-242A

Insert a new §3.4.4.9.7 to read as follows, and renumber the existing §3.4.4.9.7 as §3.4.4.9.8:

3.4.4.9.7 Reporting ADS-B Position Reference Point Flag

The Reporting ADS-B Position Reference Point Flag is a one-bit subfield within the CC subfield that a transmitting ADS-B participant **shall** (R3.xx-A) set to ONE if the A/V position that it transmits (in messages to support the SV report) is the center of the largest rectangle that (a) contains the entire horizontal extent of the A/V, (b) has length and width equal the largest possible length and width for an aircraft with the same length and width codes as are being reported in MS reports for that A/V, (c) is oriented parallel to the current heading of the A/V. Otherwise, the transmitting ADS-B participant **shall** (R3.xx-B) set this flag to ZERO. (See §2.1.2.5 for an illustration of the ADS-B position reference point.)

Note: In future versions of this MASPS (in which the MASPS version number reported in the MS report is greater than 1), there may be additional constraints on the position being reported when an A/V sets the Reporting ADS-B Position Reference Point Flag to ONE. One example of such an additional constraint might be that the ADS-B position reference point (the point being reported in the SV report as the nominal position of the A/V) should be located such that the forward extremity of the A/V should touch the forward boundary of the rectangle of which that point is the center.

Add the following text to §3.4.3.4, the description of the Horizontal Position field in the SV report:

If a transmitting ADS-B participant is broadcasting messages to support the MS report in which the “Reporting ADS-Position Reference Point” CC code is ONE, then the horizontal position that the participant broadcasts in messages to support the SV report **shall** (R3.xx) be as described in §2.1.2.5.

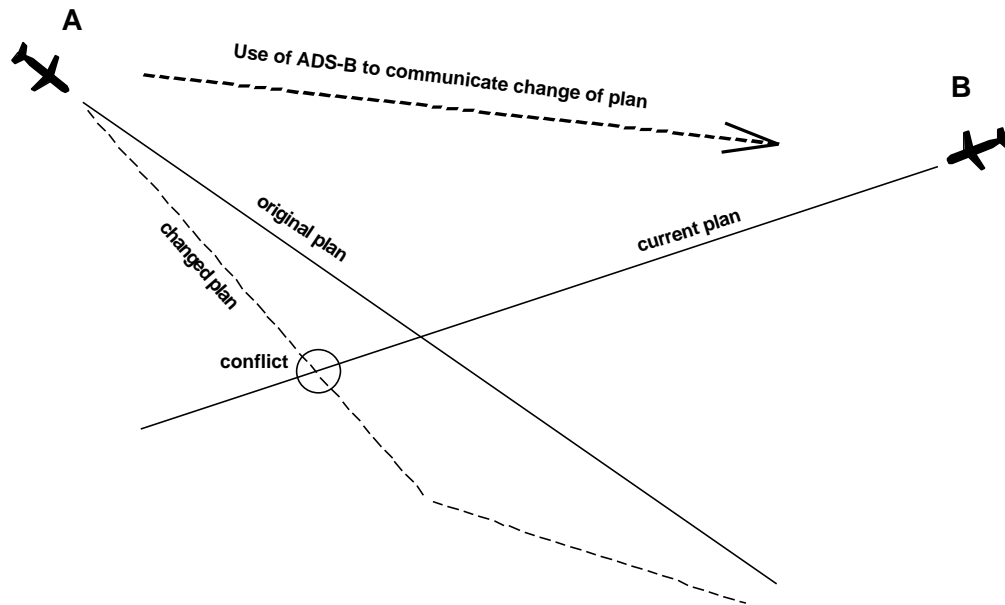
We have a serious concern about the proposed MASPS changes that would greatly increase the information transfer requirements for ADS-B. Although these would be major changes in minimum requirements, they are not based on actual applications of ADS-B and we do not concur that they are appropriate requirements to be included in a document that purports itself to be a minimum performance specification.

We have spent substantial effort studying the proposals and the supporting information submitted to WG-6. It has become clear to us that these changes were not derived directly from applications of ADS-B, but instead are being proposed as increased ADS-B capabilities that might be used for developing ADS-B applications in the future. This design philosophy, while forward looking, is not appropriate for the MASPS. The problem is that if adopted, the requirements would cause some legitimate ADS-B designs to be declared to be non-compliant with ADS-B requirements, whereas such systems actually are effective in supporting the ADS-B applications that are likely to be implemented within the next two to three decades.

The fact that these changes were not derived from specific applications is underscored by the proponents and by chairman Rocky Stone who have stated that if these changes were adopted now, they would likely have to be changed in the future as applications development evolves. We understand that one of the objectives for including these as MASPS changes is to take the lead and stimulate development of FMS avionics. We support this objective, and we believe that it can be accomplished in a less disruptive way. The specific ADS-B attributes proposed to support future applications can be documented in detail in the MASPS, in every way except actually requiring current ADS-B avionics to implement these changes at this time.

We realize that the changes proposed for increasing the update rate of Intent information were based on a calculation of the delay in communicating a change of intent between two aircraft. This calculation by itself seems reasonable to us, but it has not been formulated to correspond to an actual application of ADS-B. The calculation is based on a scenario in which two aircraft at some range such as 30 nmi, are proceeding along paths that do not conflict, as illustrated below. Then one aircraft ("aircraft A") unilaterally makes a change of intended path which conflicts with the intended path of aircraft B. The scenario begins there, and it is assumed that aircraft A is free to proceed with this new path and that aircraft B should receive the changed Intent and get out of the way. This is certainly not a reasonable basis for air-to-air deconfliction, but it is the starting point for calculating the proposed tighter ADS-B requirements. In reality, aircraft A would avoid selecting a new path that conflicts with the existing intended path of aircraft B. For this to work effectively, it is necessary for aircraft A to have received the Intent from aircraft B. This reception is not time critical, as was assumed in the analysis supporting the proposed MASPS change. This calculation does not have sufficient substance for supporting the proposed MASPS timing requirements.

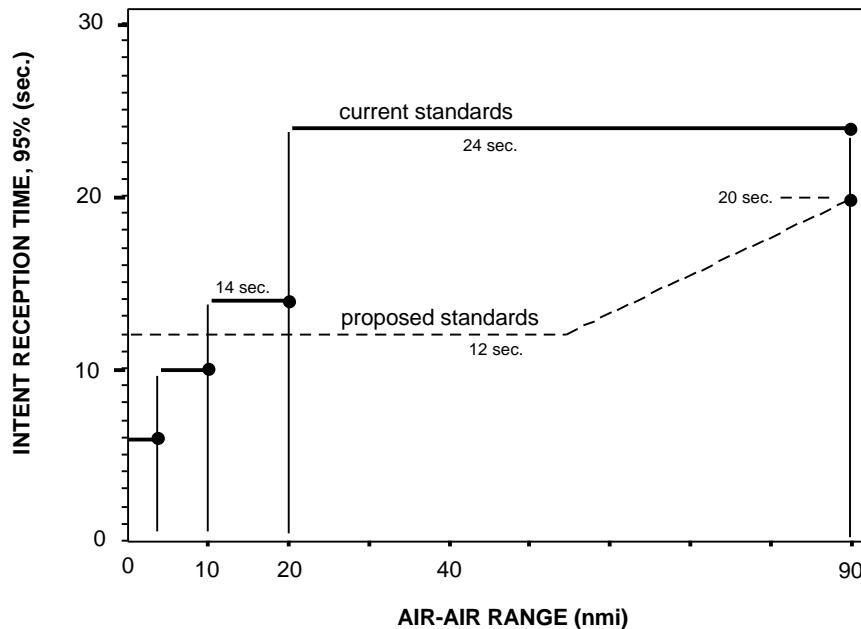
Scenario Used to Derive New Requirements for ADS-B



A comparison between proposed requirements for Intent communication and the current standards is shown below. We are struck by the fact that the proposal differs by a factor of 2 for all ranges between 20 nmi and 50 nmi. If adopted, it would double the communication data rate for Intent information. Such a very large change could, in our view, only be accepted if supported by a specific application, showing how the system performance would differ with and without the change.

Comparison Between Existing and Proposed Standards

Reception time requirement after a change of intent information



As air-to-air deconfliction is being developed, one of the major considerations concerns coordination between two aircraft. For example, if altitude separation is provided, then it should be clear to both aircraft which is to be higher and which is to be lower. The same principle applies if horizontal separation is provided. Whether this coordination can be effectively provided by a broadcast system has not yet been determined. Some researchers believe that this coordination should be done using communication that provides technical acknowledgement, so that a transmitting aircraft can determine whether a given message has been received. Some also believe that this coordination should be done using coordination acknowledgement, so that each aircraft can determine whether coordination has actually been accomplished. From both points of view, a broadcast system would not be appropriate. If this view prevails, it is likely that the new intent communication requirements proposed for ADS-B would not actually be used operationally.

Development of air-to-air deconfliction as an application of ADS-B is also being done by NLR in the Netherlands with contributors in the US, focusing on a concept in which Intent communication is not used. This is a substantial development effort, making use of simulation of large numbers of aircraft, and including interactive simulation with test pilots. The supporters of this approach are convinced that Intent communication is not necessary for effective air-to-air deconfliction. If this view prevails, it is possible for this reason also, that the new intent communication requirements proposed for ADS-B would not actually be used. Until this fundamental issue is addressed, it is not appropriate to include the requirements in the MASPS.

Note also that as ADS-B applications are being developed within SC-186, specifically in Working Group 4, none of the applications currently being brought forward for standardization involve Intent communication. Furthermore, Eurocontrol is also analyzing and developing applications of ADS-B, yet their current efforts are entirely for applications that do not include Intent communications.

In summary, there is a lack of well-defined ADS-B applications that use the Intent information proposed for the MASPS. Should those applications ever be developed, it is likely that their communication requirements will be different than those proposed for the MASPS. In fact it has not been shown that a broadcast protocol will even be appropriate for these applications. For these reasons, it is clear that the proposed changes in minimum requirements for Intent communication are not appropriate for acceptance in the ADS-B MASPS at this time.